The Dynamics of The Disability Support Pension (DSP) Recipients in Australia

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Declaration

Except where otherwise indicated this thesis contains my own work

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Abstract

The Disability Support Pension (DSP) is the payment for people of working age with an illness or injury for a prolonged period of time that prevents them from undertaking full time employment.

The number of DSP recipients has grown very rapidly over the last three decades, much faster than the DSP age eligible population. Both the increase in DSP inflow rate and the decrease in DSP outflow rate have contributed to past growth of the DSP program. But the increase in the inflow rate appeared to have contributed more than the decrease in the outflow rate, especially in the 1990s when a set of new eligibility criteria for DSP benefit was introduced.

As for changes in the inflow rate, using aggregate data, it is found that labour market conditions represented by the unemployment rate had a significant positive impact on the DSP application and grant rates. Also important were policy changes which altered the eligibility requirements for DSP benefits. The policy change in 1980 reduced the application and grant rates as expected, but the policy change in 1991 increased these rates, a result which was probably not expected at the time the policy was introduced. Other factors, such as the relative value of the DSP benefit and changes in population structure (or population ageing) did not appear to have any significant impact on the application and grant rates and therefore no significant impact on past growth of the DSP program.

Using the FaCS LDS data, it is found that, over the period between 1995-96 and 1999-2000, about 40 percent of new DSP recipients came from former unemployment benefit recipients. Among those who transferred from unemployment to DSP, not only did a large proportion (50-70 percent) experience multi-spells of income support payment recipiency prior to the transition, but also 55 to 66 percent had more than half a year pre-transition unemployment duration, with the average pre-transition unemployment duration being more than one year. It is also found that, among other factors, unemployment duration had a significant impact on the transition from

unemployment to DSP. The longer the duration on unemployment the more likely was the transition from unemployment to DSP.

Since the number of DSP recipients is also determined by the duration of recipients, determinants of duration on DSP are examined. Using the FaCS LDS data, it is found that the age at entry into DSP, gender, country of birth, amount of earned income, whether having unearned income and recipient source were statistically significant determinants of the hazard rate of DSP recipients. That is DSP recipients with different characteristics have different potentials for leaving the DSP program. The average expected completed duration of DSP recipients is estimated to be about 9 years, but it varies with gender, entry age and recipient source.

Among those who exited DSP during a specific time period, the proportion returning to work was very small and the majority transferred to the Age Pension. In addition, it is found that recipients who exited to different destinations appeared to be different groups of people, especially comparing those who returned to work with those who transferred to the Age Pension. Compared with those who transferred to the Age Pension, those who returned to work were more likely to be young when entering into DSP. They were also more likely to be male, have earned income when receiving DSP benefit and be multi-spell recipients.

One important point to emerge from the findings of this thesis is that DSP recipients are quite clearly different groups of people. They came from different sources. Recipients with different characteristics behaved differently in terms of leaving speed and exit destinations. This has important implications in terms of policy development and future research. To put it simply, future research should probably study DSP recipients by different groups (say by recipient source or entry age) rather than as a whole. Similarly, policy developments should also be differentiated to target different recipient groups so that policy will be more effective.

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Chapter 1

Introduction

1.1. Purposes of the study

The Disability Support Pension (DSP) is the payment for people of working age with an illness or injury for a prolonged period of time that prevents them from undertaking full time employment. Prior to 1991, this payment was known as the Invalid Pension (IP)[1]. In this thesis both the Invalid Pension and the Disability Support Pension are referred to as DSP.

Over the last three decades, the number of DSP recipients has grown very rapidly. In 1971 there were 134,000 recipients. By 2000 the number of individuals receiving a DSP had reached over 600,000 (Figure 1.1).

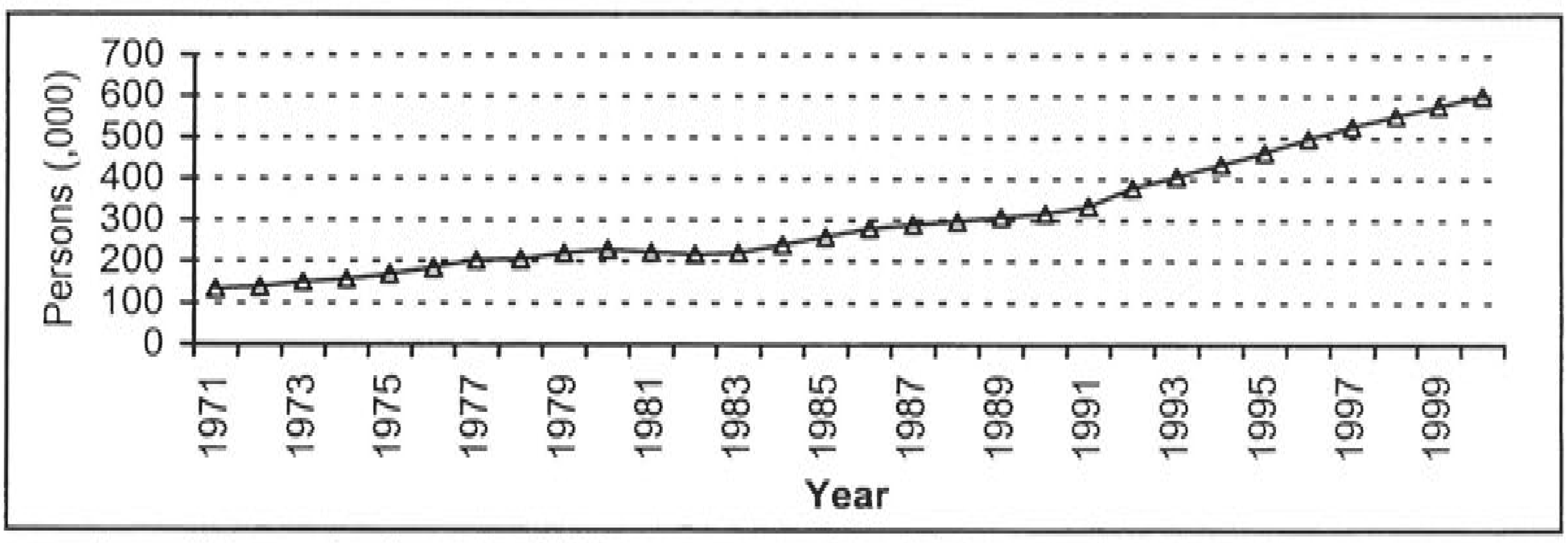
The growth rate of the number of DSP recipients has been much faster than that of the DSP age eligible population[2]. As a result, the proportion of population receiving DSP has increased (panel (a) in Table 1.1). This proportion has increased for all age groups

[1] Legislation to enact the Commonwealth Invalid Pension (IP) program was introduced into Parliament along with that for the old age pension in June 1908. The Invalid Pension came into operation in December 1910 when it became payable to persons from the age of 16 years who had resided in Australia for at least the previous five years and who were permanently incapacitated for work, provided that the incapacity arose within Australia and was not self-inflicted. With the introduction of the Disability Reform Package (DRP) in November 1991, the Invalid Pension was replaced by the Disability Support Pension and the eligibility criteria were also changed.

[2] The eligible age band for DSP is between 16 and the Age Pension age. For males the Age Pension age is 65. For females the Age Pension age was 60 years before 1995. But from 1995, every two years the female Age Pension age has been raised by a half-year and this will continue until it reaches 65. However, for simplicity, most of this thesis does not consider the change in the female Age Pension age and therefore defines the DSP age eligible population as 16 to 64 for males and 16 to 59 for females.

and reveals a sharp contrast to the fall in full-time employment (panel (b) in Table 1.1). For the male 60-64 age group population, for example, the proportion receiving DSP in 1999 was not very different from the proportion working full-time. But this was not the case 30 years ago. Today, one in four males aged 60-64 receives the DSP. For males aged 45 years and over, the DSP and sickness benefit are the main sources of welfare receipts, far more important than the unemployment benefit (Bond and Whiteford, 2000).

Figure 1.1: Number of DSP recipients, 1971 to 2000



Sources: *Annual Report* (each year) of the Department of Social Security (DSS). *DSS Customers* (each year from 1994 to 2000) compiled by DSS or the Department of Family and Community Services (FaCS).

The primary question is why the number of DSP recipients has grown so rapidly? This thesis firstly addresses this question by looking at inflows and outflows (or completed duration) of DSP recipients. It is found that over the last three decades both changes in the inflow and outflow rates have contributed to the growth of the number of DSP recipients (or program growth), but the change in the inflow rate was more important, especially in the 1990s. In addition, while the outflow rate showed a relatively smooth trend of decrease, the inflow rate varied considerably, and in the 1990s the inflow rate increased substantially.

A second group of questions then arises: Why did the inflow rate vary more than the outflow rate? What determines the inflow rate and what are the reasons for the past changes in the inflow rate which have led to the rapid growth of the program over the last three decades? Why was the inflow rate so high in the 1990s? These questions are answered in Part I of this thesis using aggregate data.

Table 1.1: Proportions of population receiving DSP or working full-time, male

	1971	1981	1991	1999
(a). Proportion of population receiving DSP (%)				
15-24	0.62	0.78	0.89	1.67
25-44	1.14	2.22	2.92	3.60
45-59	2.62	6.64	9.03	11.14
60-64	9.79	15.41	22.76	25.23
Total (15-64)	1.88	3.64	5.07	6.51
(b). Proportion of population working full-time (%)				
15-24	66.50	62.27	45.36	40.07
25-44	92.08	87.55	82.30	79.50
45-59	89.88	82.54	76.00	72.73
60-64	71.92	44.34	36.64	33.85
Total (15-64)	83.25	77.06	69.10	66.48

Sources: 1. DSP recipients by age group are from Bond and Whiteford (2000). Note that DSP age groups 15-24 and 25-44 include persons receiving the sickness benefit.

2. Population and full-time employment are from *Australian Demographic Statistics, ABS 3101.0, Employment and Unemployment, ABS 6213.0,* and *Labour Force, Australia, Preliminary, ABS 6202.0.*

To better understand changes in the number of DSP recipients, the second part of this thesis examines inflows and outflows from a micro perspective, using administrative data from the Department of Family and Community Services (FaCS). Specifically, it addresses the following questions: what is the composition of DSP inflows? What determines whether a person is to participate in the DSP program? Once granted a DSP benefit, what determines the duration on the DSP benefit before leaving the program? How long is a recipient expected to be on the program? For those who leave, where do they go? Do recipients who leave for different reasons have the same characteristics?

By providing answers to the above questions, this thesis enhances our understanding of the dynamics of DSP recipients and the reasons for the growth of the program. This understanding will hopefully serve as guideline to policy development.

1.2. Structure of the thesis

The thesis consists of two parts. The first part includes Chapter 2 and 3, which uses aggregate data to explain the growth of the DSP program from a macro perspective. The second part, consisting of Chapter 4, 5, 6, and 7, looks at inflows and outflows from a micro perspective to provide the micro foundations for understanding variations in aggregate inflows, outflows and growth. The following is a brief outline of each chapter.

Part I

Chapter 2: Inflows, outflows and the growth of the DSP program – an overview

By providing an inflow-outflow framework for analysing the growth of the DSP program, this chapter addresses the following questions: (i) what have been the contributions of inflows and outflows to the growth of the program over the last three decades? (ii) Of inflows and outflows, which is more important as a contributor to the past growth of the program? (iii) What factors determine the inflow rate, and what contribution have they made to the change in the inflow rate over the last three decades.

Chapter 3: Labour market conditions, DSP applications and grants

Since inflow rate changes were more important than changes in the outflow rate as contributors to the growth of the program, this chapter examines the reasons for the changes in the inflow rate, focusing on the effect of labor market conditions on the applications for, and the grants of, disability benefit in the context of program growth. The impact of labour market conditions on DSP applications, grants and the restrictiveness of implementing the eligibility criteria rules by the administrative authority (or policy changes) are also examined and shown to be significant.

The impacts of the population structure change (population ageing), the relative benefit level and policy changes are also examined. The results confirm that the unemployment rate has a statistically significant impact on DSP application and grant rates. Also important are the policy changes in the eligibility criteria for DSP. Population ageing and the benefit level appear to have little effect on the change in the inflow rate.

Part II

Chapter 4: Transition from unemployment to DSP

Although data are not available for examining the determinants of DSP participation for all new recipients, this chapter examines one main source of DSP inflows – transition from unemployment to DSP, to study inflows from a micro perspective.

Administrative data on income support payments show that a large proportion (more than 40 percent) of DSP inflows are from unemployment benefit recipients. This chapter examines the pre-transition experience of those who transferred from unemployment to DSP and identifies the factors that impact on this transition. It is found that a large proportion of those who transferred from unemployment benefit to DSP had multi-spells of income support payment recipiency before the transition and that the average duration on unemployment benefit before the transition was also quite long. In addition, it is found, among other things, that the probability of transition from unemployment to DSP is affected by duration on unemployment benefit. This chapter reaffirms the results of Chapter 3 that there is a close link between unemployment and DSP inflows.

Chapter 5: Determinants of duration on DSP – an application of the duration model

After being granted a DSP benefit, what determines duration on the program? This chapter addresses this question by applying a duration model to a selected sample of new recipients from the FaCS one percent longitudinal data set (LDS). The determinants of duration are important because the number of DSP recipients is also determined by the duration of recipients. Identifying factors that determine the duration on benefit may provide knowledge on how to increase the outflow rate and to reduce the number of DSP recipients. The results show that entry age, gender and recipient source, among other factors, are important determinants of the hazard rate and duration.

Chapter 6: Length of stay on the DSP program

The commonly reported duration on DSP (including other income support payments) by the administrative authority is misleading. The reported data refer to interrupted spells. To fully understand the length of stay, the duration of completed spells should be estimated. This chapter uses the estimated parameters from Chapter 5 to estimate duration of completed spells of DSP recipients. For an entry cohort, the average expected duration of completed spells is about 9 years, but it varies with entry age, gender and recipient source.

Chapter 7: DSP Exits – where do they go?

DSP recipients do not stay on the program forever, nor do all recipients stay until the Age Pension age. When they leave, where do they go? What are the most common reasons for leaving DSP? If there are different exit destinations, who is more likely to leave for a specific destination? These questions are addressed in this chapter. The data show that among those who left DSP during a given period of time, a very small proportion returned to work, while a large proportion transferred to the Age Pension. It is also found that those who returned to work had different characteristics from those who transferred to the Age Pension. Those who returned to work were more like to be younger on entering DSP, male, have earned income when receiving DSP benefit and have multi-spells of DSP recipiency.

The combination of these chapters will provide a relatively complete picture of the dynamics of DSP recipients - inflows, outflows, duration and growth of the program.

1.3. The data used

For the first part (Chapter 2 and 3) of this thesis, aggregate data (national or state level) were used and these data were collected by the author mainly from publications by the social security administrative authorities (the Department of Family and Community Services (FaCS) or the Department of Social Security (DSS)) and the Australian Bureau of Statistics (ABS).

The second part of this thesis (Chapter 4, 5, 6, and 7) is mainly based on the one percent sample LDS data at FaCS. The LDS data set contains fortnightly records of all income support payment recipients, including information such as the demographic details of recipients, payment type, payment amount, duration and private income. The one percent sample LDS data set currently covers the period between 6 January 1995 and 16 June 2000[3]. This data set has the virtue of being longitudinal data, but suffers from the usual problems of administrative data. In Chapter 7, which identifies the reasons for DSP benefit terminations and disability types, two other FaCS data sets are used. These data contain termination reasons and disability types of DSP recipients. These two data sets can be matched with the one percent sample LDS data using the *customer ID* variable.

[3] For detailed descriptions of this data set, please refer to **LDS 1% Sample User Documentation**, which is constructed by the Information Strategies Branch at FaCS.

Chapter 2

Inflows, Outflows and the Growth of the DSP Program – An Overview

2.1. Introduction

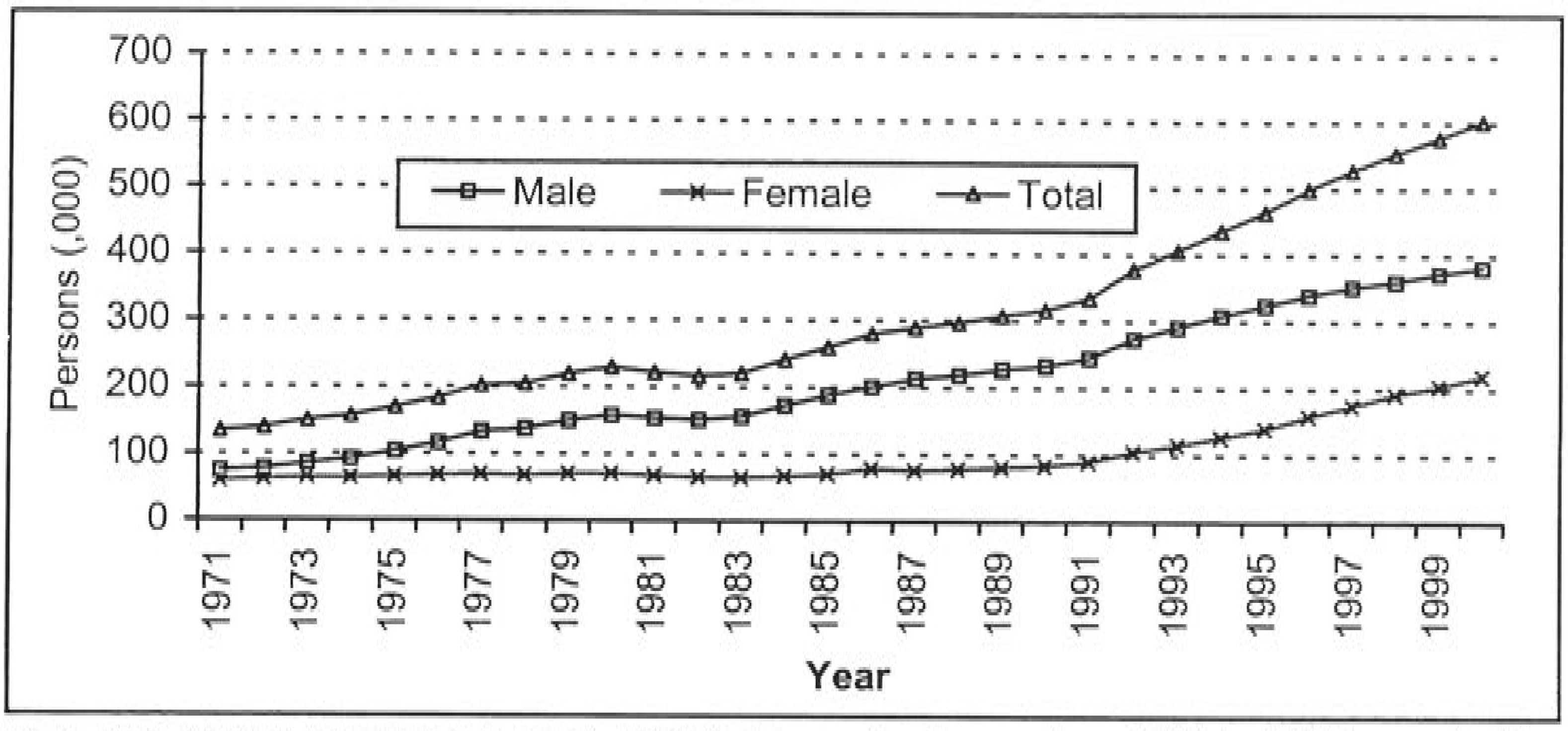
Over the last three decades, the DSP program has grown rapidly. The number of DSP recipients increased from 134,000 in 1971 to 602,000 in 2000, with an average annual growth rate of 5.32 percent. This growth is much greater than that of the DSP age eligible population over the same period, which has increased from 7.8 million in 1971 to 12.2 million in 2000, with an average annual growth rate of 1.55 percent.

While the growth rates of the DSP age eligible population for males and females are almost the same (1.55 percent for males and 1.64 percent for females), the number of male DSP recipients has grown much faster (see Figure 2.1). For male DSP recipients the average annual growth rate is 5.81 percent, while for female recipients the rate is 4.60 percent. Not surprisingly then, the difference in the number of male and female recipients has been rising since 1971. As discussed in Appendix 2B, there is a wider range of benefit types that can provide income support for females than for males and this may be one important reason for the different growth rates. It is also obvious from Figure 2.1 that the number of female recipients was quite stable during the 1970s and 1980s, and it was only during the 1990s that the number of female recipients began to increase as quickly as their male counterparts.

There may be several reasons for the faster growth of female DSP recipients during the 1990s. These include: (i) policy changes in 1991, which made accessibility to DSP easier and imposed a time limit on sickness benefit (this might disproportionately shift women from sickness benefit to DSP), (ii) phasing out of the Widow B pension from 1987, which also might move more women into DSP (see Appendix 2B), and

(iii) the increase in the female Age Pension age from 1995 (this might have an inflow impact and a duration impact on the number of female DSP recipients).

Figure 2.1: Number of DSP recipients by gender, 1971 to 2000



Source: DSS *Annual Report* (each year). *DSS Customers* (each year from 1994 to 2000) compiled by DSS or FaCS.

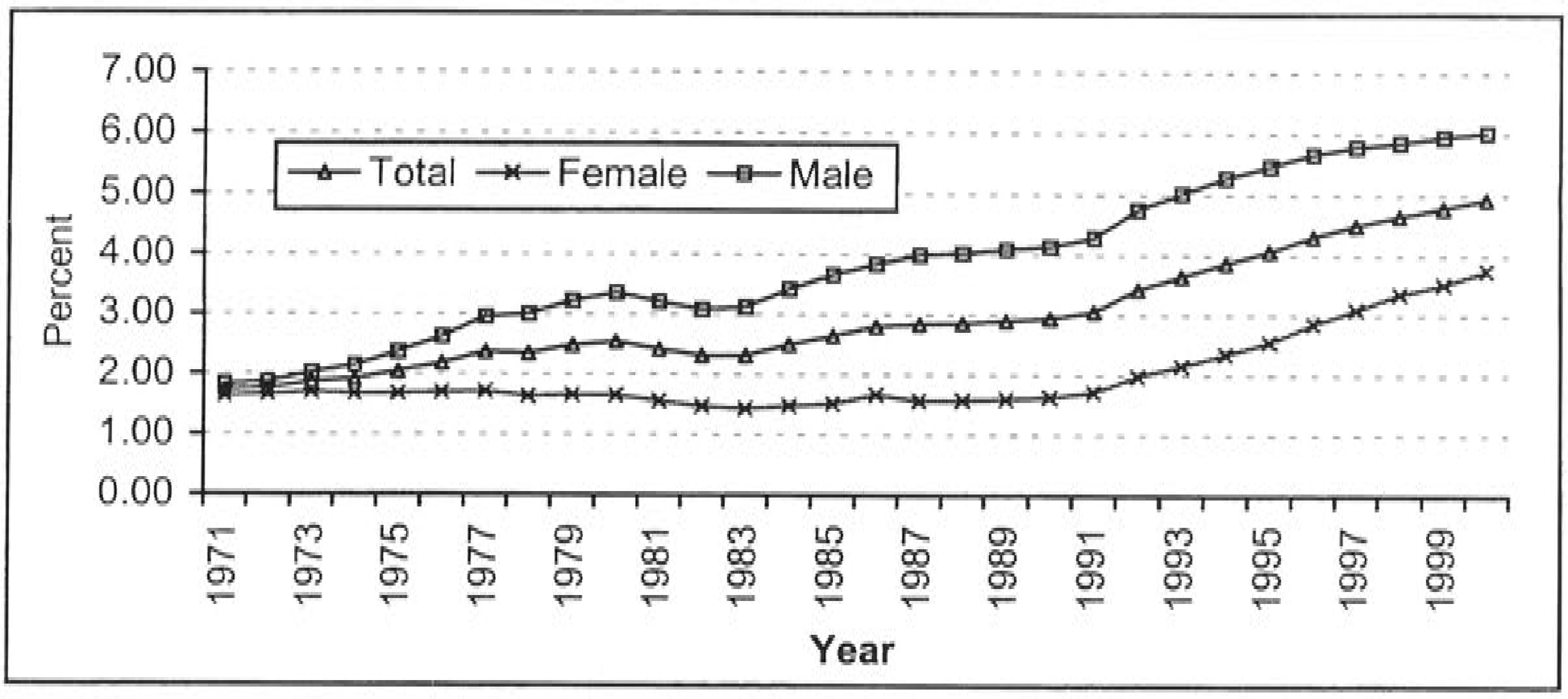
As a result of the much faster growth of DSP recipients relative to the DSP age eligible population, the ratio of DSP recipients to the DSP age eligible population, referred to as the incidence rate, has been rising strongly over the period 1971 to 2000 (See Figure 2.2). In 1971, this ratio was 1.73 percent, but it increased to 4.93 percent in 2000. The incidence rate increased more for males (from 1.83 percent in 1971 to 6.02 percent in 2000) than for females (from 1.63 percent to 3.75 percent).

It is noticeable that the growth of DSP recipients is not smooth. Three periods corresponding to the last three decades stand out: (i) there was a gradual increasing trend during the 1970s, (ii) the first two years of the 1980s saw a slight decline in this trend followed by a growth rate similar to that of the 1970s, and (iii) the 1990s witnessed a faster growth rate than that of the previous two decades[1]. The prominent

[1] The average annual growth rates for 1971-1981, 1981-1999 and 1991-2000 are 5.17, 4.18, 6.76 percent, respectively.

questions prompted by these figures are why this pattern appeared and why the number of DSP recipients has grown so fast, especially in the 1990s.

Figure 2.2. Ratio of DSP recipients to DSP age eligible population by gender, 1971 to 2000



Sources: The number of DSP recipients as in Figure 2.1.

The DSP age eligible population is derived from *Australian Demographic Statistics, ABS 3101.0.*

This chapter provides some possible answers to these questions in the context of an analysis of inflows and outflows. It first uses aggregate data to show that the increase in the inflow rate has contributed more to the program growth than the decrease in the outflow rate. It then discusses the determinants of the inflow rate and infers their relative contribution of these determinants over the last three decades.

2. 2. Inflows, outflows and growth

The number of DSP recipients at a point of time can be viewed as a pool with an inflow and an outflow, as illustrated in Figure 2.3. An increase in the number of DSP recipients can occur by,

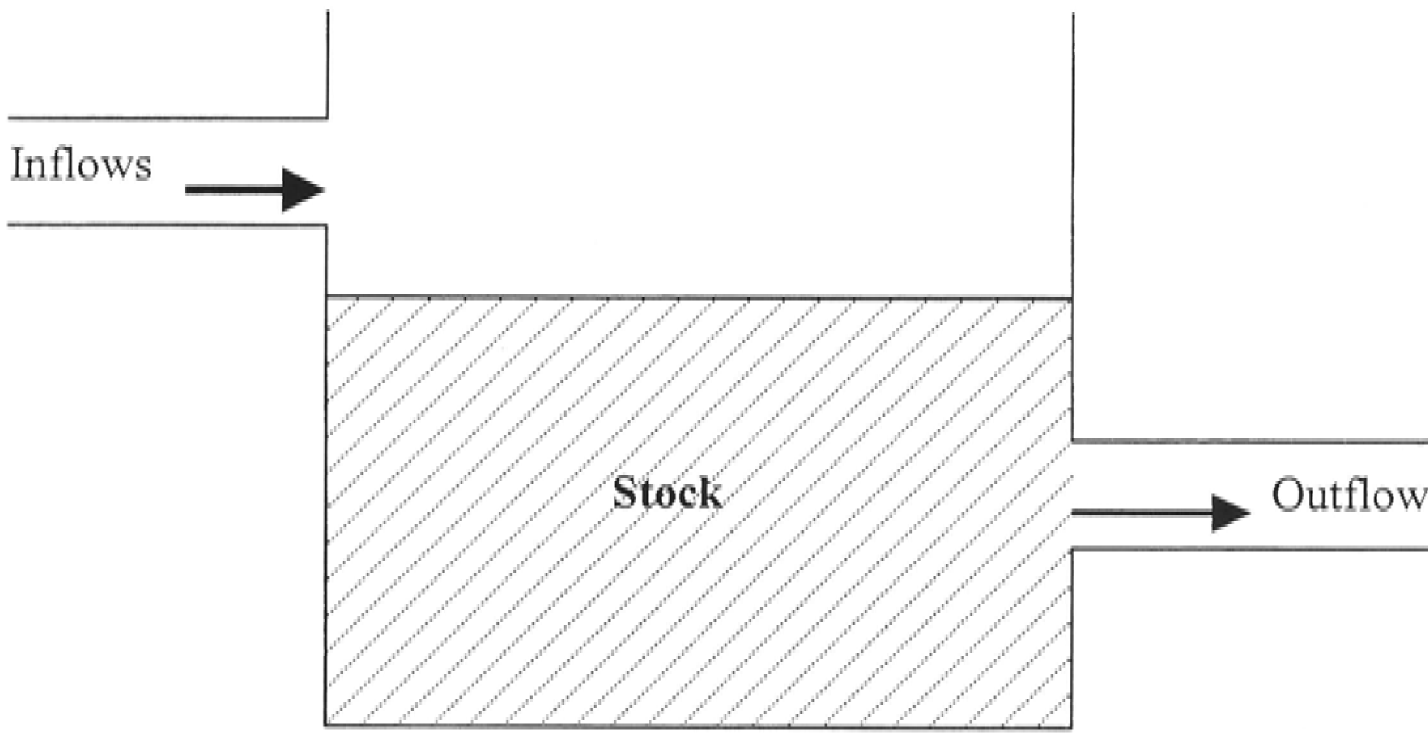
(a) an increase in inflows, if outflows remain constant;

(b) a decrease in outflows, if inflows remain constant; or

(c) an increase in inflows and a decrease in outflows at the same time.

This section looks at inflows and outflows of DSP recipients and assesses their impacts on the growth of the program. We begin with a special case, a steady state model, which is used to illustrate the relationship between inflows, outflows and growth.

Figure 2.3: Inflows, outflows and stock



2.2.1. The steady state relationship between inflows, outflows and growth

In the steady state, the number of persons entering into the DSP program each year and the continuation rate, as defined below, are assumed constant. Suppose each year a fixed number of persons F enter into DSP. Also suppose the continuation rate for period x is[2]:

$$p_{x,t} = \frac{f(x+1,t)}{f(x,t)} \qquad (2.1)$$

where $f(x,t)$ denotes the number of persons in the entry cohort of year t who stay for x years. The continuation rate lies between 0 and 1 and is assumed constant for all

[2] Note that $1 - p_{x,t}$ is the outflow rate for period x of the cohort.

cohorts, i.e. $p_{x,t} = p_x$. Then the number of DSP recipients in any given year, D, is given by:

$$D = F + Fp_1 + Fp_1 p_2 + Fp_1 p_2 p_3 + \dots$$
$$= F(1 + p_1 + p_1 p_2 + p_1 p_2 p_3 + \dots). \qquad (2.2)$$

Since F and p_x are assumed to be constant over time, D is also constant over time. The average completed duration for the F people who begin DSP in the same year, S, is given by:

$$S = 1(1 - p_1) + 2p_1(1 - p_2) + 3p_1 p_2(1 - p_3) + \dots$$

That is, one year multiplied by the probability of staying one year, two years multiplied by the probability of staying two years, and so on. The above equation can be rewritten as:

$$S = 1 + p_1 + p_1 p_2 + p_1 p_2 p_3 + \dots. \qquad (2.3)$$

Therefore, from (2.2) and (2.3):

$$D = FS. \qquad (2.4)$$

In the steady state the number of DSP recipients equals the product of the inflows each year and their average completed duration. The number of DSP recipients will increase if either the inflows F or the average completed duration S increases. Since the completed duration is determined by the continuation rate or the outflow rate, changes in the outflow rate determine the number of DSP recipients by changing the average completed duration.

Divide both sides of equation (2.4) by P, the DSP age eligible population, and denote this by R_d:

$$R_d = \frac{D}{P} = \frac{F}{P} S . \tag{2.5}$$

This equation demonstrates the steady state relationship between the DSP incidence rate, the inflow rate and completed duration. The DSP incidence rate is equal to the inflow rate multiplied by the average completed duration. With a constant inflow rate, an increase in the average completed duration (equivalent to a decrease in the outflow rate) will lead to an increase in the DSP incidence rate. Similarly, with a constant average completed duration, an increase in the inflow rate will increase the incidence rate.

Thinking of the DSP incidence rate in this way makes clear a number of important points. First, it is useful to think of policy impact in this framework. Some policy changes impact on inflows and others on completed duration.

Second, the duration of DSP recipients is normally long. Consequently, a permanent change in inflows from one level to another has an extended impact on the number of DSP recipients. Therefore, where inflow changes are important it is often not appropriate to analyze variations in the number of DSP recipients without a long lag structure. For example, consider a one off permanent increase in inflows. If the estimated completed duration of every DSP recipient is 9 years (see Chapter 6), the impact of an increase in inflows will take 9 years to be fully effective. If there is a dispersion around the mean duration and some recipients experience a duration longer than 9 years, the impact of a change in inflows on the number of DSP recipients will take longer than 9 years to fully work out. For this reason it is probably better to work on inflows and duration separately rather than to work on the number of recipients alone to facilitate understanding of variations in the number of DSP recipients.

Third, any policy which impact directly on an across-the-board change in duration will have a quicker effect than a policy that focuses only on changing the rate of inflows.

Although the above framework is very useful it can only be precisely applied in a steady state environment. In practice therefore, during periods of change, the approach will need to be modified and the conceptual framework will not be quite as simple or as clear-cut. This modification is provided later in this chapter.

In the next subsection the variations in inflows and outflows of DSP recipients for the last three decades are presented to see which of these had the most effect on past growth.

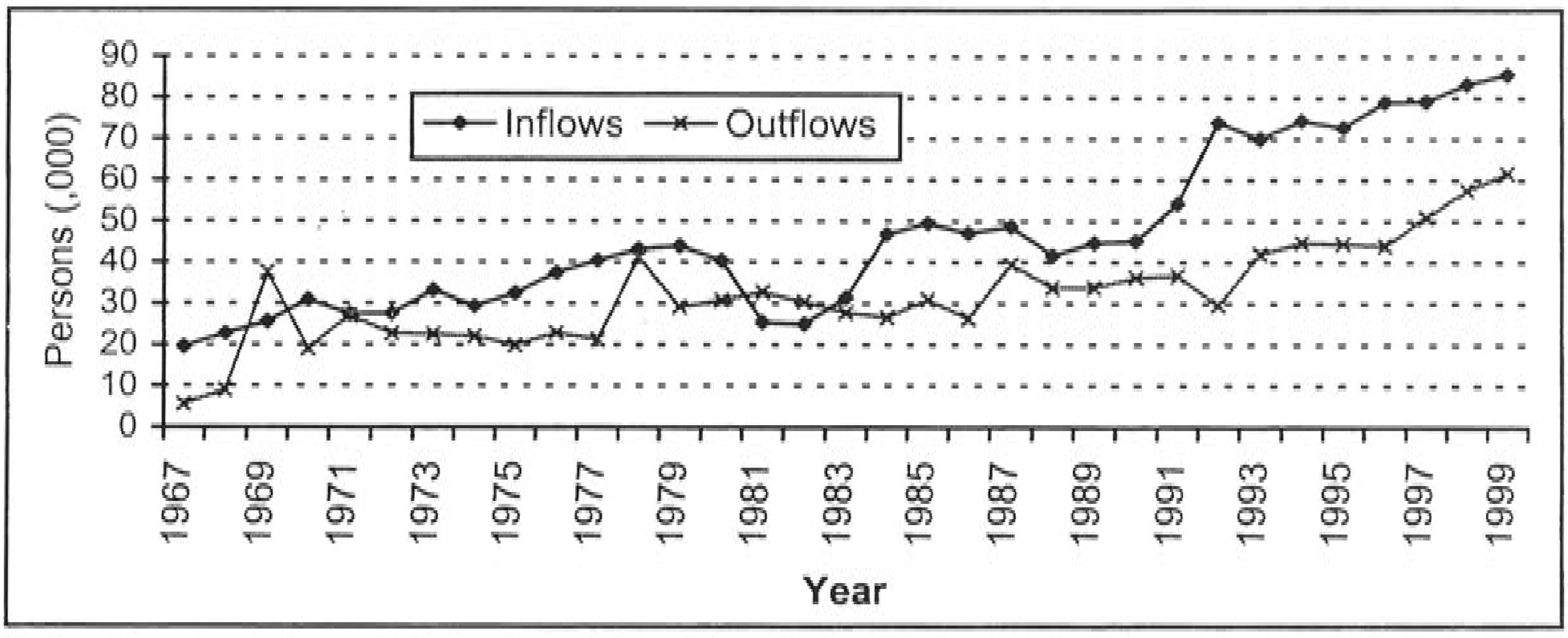
2.2.2. Inflows and outflows of DSP recipients

Figure 2.4 plots inflows and outflows of DSP recipients over the financial years 1966-67 to 1998-99. Over this period, except for very few years (1968-69, 1980-81, and 1981-82) inflows were greater than outflows and, therefore, the number of DSP recipients was increasing. Another interesting pattern is that the large changes in inflows in the early 1980s, 1987-88 and early 1990s, were accompanied by large policy changes as well as significant increases in unemployment in the first and last periods.

From Figure 2.4 it is apparent that the variation of outflows was not as great as the variation of inflows. Outflows are determined by past inflows and the continuation rate and the data suggest stability in the continuation rate. The average duration of DSP recipients is about 9 years (Chapter 6). The effect of long duration acts as an application of a weighted average of past inflows to produce current outflows and, as a result, the outflows will be smoother than the inflows unless there are substantial shocks that influence all continuation rates in a similar fashion.

It is the difference between inflows and outflows that leads to the change in the number of DSP recipients. From the financial year 1991-92 the difference between inflows and outflows (or net inflows) became much larger than before and, as a result, the following decade saw the largest increase in the number of DSP recipients. Between 1966-67 and 1979-80 average net inflows were 8,800 persons per year and between 1980-81 and 1990-91 average net inflows increased to 10,200 persons per year. Between 1991-92 and 1998-99 average net inflows became more than 30,400 persons per year. Since net inflows add directly to the number of DSP recipients, the greater difference between inflows and outflows in the 1990s led to a substantially higher growth in the number of recipients as clearly indicated in Figure 2.1.

Figure 2.4: Inflows and outflows of DSP recipients, 1966-67 to 1998-99 [3,4]



Regardless of the variations, absolute inflows and outflows showed a trend of increase. An increase in absolute inflows may be caused either by the rising DSP age eligible population or by increases in the inflow rate or both. An increase in outflows may be caused either by increases in the number of DSP recipients or increases in the outflow rate (or reductions in the continuation rate). How do changes in the inflow and outflow rates affect the total number of DSP recipients?

To address this question, Figure 2.5 moves the analysis from the absolute number of inflows and outflows to the inflow and outflow rates, where the inflow rate is defined as the ratio of inflows each financial year to the DSP age eligible population at the beginning of the financial year. The outflow rate is defined as the ratio of outflows in

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[3]The numbers of inflows before 1996 are taken from DSS publications, the numbers between 1996 and 1999 are estimated by the author from the FaCS LDS data. Prior to 1982 inflows did not include those who transferred from other pensions. The numbers of outflows were derived from the inflows and the number of recipients, using the identity, *the number of DSP recipients this year = the number of recipients last year + inflows this year – outflows this year.*

[4] The year in this figure refers to the financial year ending in that year. For example 1999 stands for the financial year 1998-99.

each financial year to the number of DSP recipients at the beginning of the financial year[5].

Presentation of the data as the inflow and outflow rates yields a slightly different picture of past history. Policy changes in 1980 and 1991 were associated with large changes in the inflow rate. In 1980 the eligibility criteria for DSP was tightened by administrative change, although there was no legislative change to the criteria (Cass, Gibson and Tito, 1988). A commensurate fall in the inflow rate was clearly evident following the 1980 policy change, but within a few years the inflow rate had returned to its previous level.

In 1987 the eligibility criteria was tightened again with the requirement that 50 percent of the incapacity be caused by physical or mental impairment. There was a slight decline in inflows and the inflow rate, but it is not clear why the impact of the 1987 policy change was not as substantially as that in 1980. There was considerable debate about changing the eligibility criteria to contain the rapid growth of the DSP program before the actual introduction of the new policy in 1987. Perhaps the eligibility criteria might have been tightened in practice before 1987 (as shown in Figure 2.5, the inflow rate started to fall in 1985). In addition, the unemployment rate had been falling over the period and this might have contributed to the decrease in the inflow rate and masked the effect of the 1987 policy change.

Another large policy change occurred in 1991 when the Disability Reform Package (DRP) was introduced, with large changes in the eligibility criteria, which effectively made access to DSP easier (see Section 2.3 for more details). As a result, the inflow rate increased. Between 1970-71 and 1979-80 the average inflow rate was 0.42 percent. Between 1980-81 and 1990-91 the inflow rate fluctuated substantially and the average inflow rate was 0.41 percent. Between 1991-92 and 1998-99 the average inflow rate was 0.66 percent. Since the introduction of the DRP, the average inflow rate has been 0.16 percentage points higher than the highest rate before its introduction.

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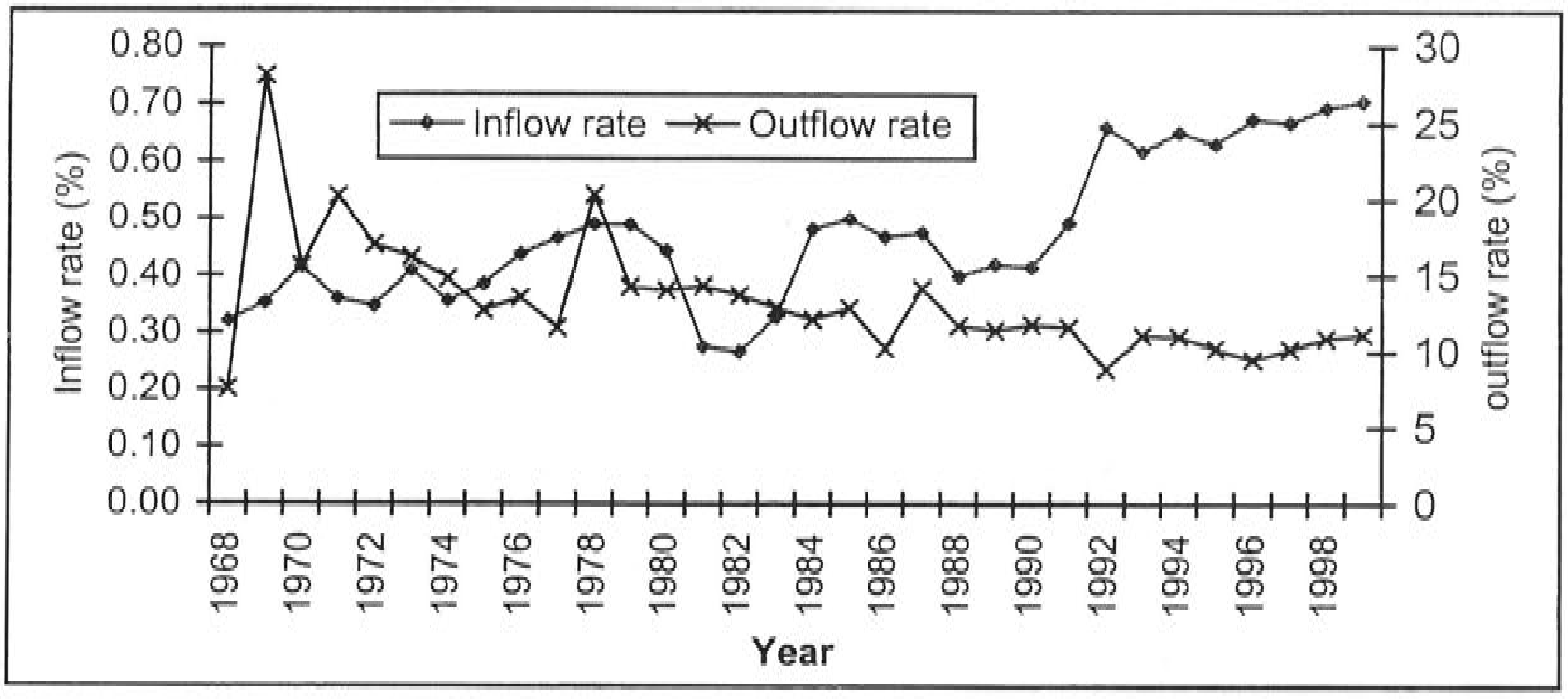
[5] Note here the definition of the outflow rate is slightly different from that defined in footnote 2. In footnote 2, the outflow rate is defined for an entry cohort.

Figure 2.5: The inflow and outflow rates of DSP recipients, 1967-68 to 1998-99



Presentation of the data in terms of the inflow rate also makes clear that there was no a clear upward trend in the inflow rate before 1990 and that the main change appeared to be an increase in the inflow rate to a new plateau in the 1990s.

Unlike the number of outflows, the outflow rate showed a trend of decrease over the last three decades. That is the duration on DSP has probably been slowly increasing. Furthermore, although the inflow rate change was large in response to policy changes, the outflow rate change was relatively unresponsive, reflecting the fact that the average duration is long and policy impacted directly on inflows rather than on the continuation rate. It is also noticeable that the outflow rate during 1990s continued to fall at much the same rate as previous decades and that there was no sudden change in behavior like that observed in the inflow rate.

A decrease in the outflow rate will increase the duration of stay on the program and thus contribute to the increase in the number of recipients. Both the increase in the inflow rate and the decrease in the outflow rate, therefore, could have contributed to the past growth of the DSP program.

It is worth noting that the main chapters in this thesis address the key questions arising from Figures 2.4 and 2.5.

(a) Is the inflow or outflow rate more important in determining the growth of the number of DSP recipients? This is the task of the next subsection in this chapter;

(b) Why does the inflow rate vary so much and what determines the change in the inflow rate? Why was the inflow rate so high in the 1990s? (Chapter 3.)

(c) What is the impact of policy changes on the increase in the inflow rate? (Chapter 3.)

(d) What is the composition of inflows and what determines whether a person is to participate in the DSP program? (Chapter 4.)

(e) As for outflows, who leaves quickly and who leaves slowly? How long will a recipient stay on DSP? If recipients leave DSP, where do they go? (Chapter 5, 6 and 7.)

2.2.3. The role of the inflow and outflow rate changes in program growth over the period 1971 to 1999

The previously developed steady state model provides a framework to facilitate an understanding of the relationship between inflows, outflows and growth. As noted earlier, steady state conditions do not hold and to assess the relative contributions of the changes in the inflow and outflow rates in a dynamic context, we need a different approach which can build on the insights of the steady state model.

First, note that the change in the number of DSP recipients in year $t+1$, ΔD_{t+1}, equals inflows in year $t+1$, I_{t+1}, minus outflows in year $t+1$, O_{t+1}, i.e.,

$$\Delta D_{t+1} = I_{t+1} - O_{t+1}. \qquad (2.6)$$

$I_{t+1} = R^I_{t+1} \times P_{t+1}$, where R^I_{t+1} is the inflow rate in year $t+1$ and P_{t+1} is the population at the beginning of year $t+1$, and $O_{t+1} = R^O_{t+1} \times D_t$, where R^O_{t+1} is the outflow rate in year $t+1$ and D_t is the number of DSP recipients at the beginning of year t. Then,

$$\Delta D_{t+1} = R^I_{t+1} \times P_{t+1} - R^O_{t+1} \times D_t$$
$$= (R^I_t + \Delta R^I_{t+1}) \times (P_t + \Delta P_{t+1}) - (R^O_t + \Delta R^O_{t+1}) \times D_t, \quad (2.7)$$

where ΔR^I_{t+1} is the change of the inflow rate from year t to year $t+1$, ΔP_{t+1} is the change in the population and ΔR^O_{t+1} is the change in the outflow rate. Reorganize (2.7),

$$\Delta D_{t+1} = (R^I_t \times P_t - R^O_t \times D_t)$$
$$+ R^I_t \times \Delta P_{t+1} + \Delta R^I_{t+1} \times P_t - \Delta R^O_{t+1} \times D_t + \Delta R^I_{t+1} \times \Delta P_{t+1} \quad (2.8)$$

Equation (2.8) decomposes the change in the number of DSP recipients into five parts.

The first term in the right hand side of (2.8) shows that, even though the inflow rate, the outflow rate and the population are all fixed, there may still be a difference between inflows and outflows, which leads to a change in the number of DSP recipients. Denote this part of the change as ΔD^1_{t+1} (i.e. $\Delta D^1_{t+1} = R^I_t \times P_t - R^O_t \times D_t$).

The second term in (2.8) is the contribution of the change in population. The third and fourth terms measure contributions from changes in the inflow and outflow rates, respectively. The fifth term measures the interaction between changes in the inflow rate and population.

This decomposition can be used to analyze the changes of the number of DSP recipients between two points of time, but is not directly applicable to a multi-period dynamic because, for multi-periods, the number of DSP recipients is endogenous. But the ideas behind equation (2.8) can be extended to a multi-period analysis to roughly assess the impacts of factors of interest, such as population growth and changes in the inflow and outflow rates, on the change in the number of DSP recipients.

Note that, if both the inflow and outflow rates are fixed, but allowing the population to change, the change in the number of DSP recipients, denoted as ΔD_{t+1}^{2} is:

$$\begin{aligned}\Delta D_{t+1}^{2} &= R_t^I \times (P_t + \Delta P_{t+1}) - R_t^O \times D_t \\ &= R_t^I \times P_t + R_t^I \times \Delta P_{t+1} - R_t^O \times D_t \\ &= \Delta D_{t+1}^{1} + R_t^I \times \Delta P_{t+1}, \end{aligned} \tag{2.9}$$

then the difference $(\Delta D_{t+1}^{2} - \Delta D_{t+1}^{1}) = R_t^I \times \Delta P_{t+1}$, is the impact of the change in population as discussed above.

If only the inflow rate is fixed, the change in the number of DSP recipients , denoted as ΔD_{t+1}^{3} is

$$\begin{aligned}\Delta D_{t+1}^{3} &= R_t^I \times (P_t + \Delta P_{t+1}) - (R_t^O + \Delta R_{t+1}^O) \times D_t \\ &= \Delta D_{t+1}^{2} - \Delta R_{t+1}^O \times D_t. \end{aligned} \tag{2.10}$$

The difference between ΔD_{t+1}^{3} and ΔD_{t+1}^{2} is the impact of the change in the outflow rate.

If the outflow rate is fixed, the change in number of DSP recipients, denoted as ΔD_{t+1}^{4} is

$$\begin{aligned}\Delta D_{t+1}^{4} &= (R_t^I + \Delta R_{t+1}^I) \times (P_t + \Delta P_{t+1}) - R_t^O \times D_t \\ &= R_t^I \times (P_t + \Delta P_{t+1}) + \Delta R_{t+1}^I \times (P_t + \Delta P_{t+1}) - R_t^O \times D_t \\ &= \Delta D_{t+1}^{2} + \Delta R_{t+1}^I \times P_t + \Delta R_{t+1}^I \Delta P_{t+1}. \end{aligned} \tag{2.11}$$

The difference between ΔD_{t+1}^{4} and ΔD_{t+1}^{2} is the impact of the change in the outflow rate adjusted by a factor $\Delta R_{t+1}^I \times \Delta P_{t+1}$.

Following this framework, four hypothetical numbers of DSP recipients are derived by: (i) fixing the inflow and outflow rates and population, (ii) fixing the inflow and outflow rates, but allowing the population to change[6], (iii) fixing the inflow rate only and allowing the outflow rate and the population to take their actual values each year, and (iv) fixing the outflow rate only.

As noted earlier, even though the inflow and outflow rates and population are kept constant, the number of DSP recipients can still change due to the initial imbalance of the inflow and outflow rates[7]. Thus the change in the number of DSP recipients from (i) is because of the initial imbalance. The difference of the change in the hypothetical numbers of DSP recipients between (ii) and (i) can be roughly attributed to the impact of the change in population. The difference of the change between (iii) and (ii) can be attributed to the impact of the change in the outflow rate. The difference of the change between (iv) and (ii) can be roughly attributed to impact of the change in the inflow rate[8].

Table 2.1 presents the results for each of the last three decades and the three decades as a whole.

The number of DSP recipients increased in each decade, leading to an increase of 443,400 recipients over the period 1971 to 1999. Most of the increase was concentrated in the 1990s (55 percent). The increase in the other two decades was relatively small, each accounting for 22 percent.

The first row in Table 2.1 shows that the impact of the initial imbalance varied substantially across the three decades and is consistent with the results in Figure 2.4.

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[6] Although changes in population structure may affect the inflow rate, this is not accounted for in these projections because the age specific inflow rate for the financial years before 1995-96 was not available. It will be shown later that changes in population structure are relatively unimportant.

[7] Initial balance means that, at the start of a period, the inflow and outflow rates are such that inflows equal outflows in the first year of the period.

[8] The hypothetical number of DSP recipients from (iv) does not consider the adjustment factor, $\Delta R_{t+1}^{I} \times \Delta P_{t+1}$. But even if this factor is adjusted in calculations, the final results are roughly the same. So in the reported results, the adjustment factor is not considered.

From Figure 2.4, in the financial year 1970-71, the difference between inflows and outflows was trivial and this resulted in a negligible impact of the initial imbalance on the change in the number of DSP recipients during the first decade and the three decades as a whole. In 1980-81, inflows were smaller than outflows and, therefore, during the second decade the impact of the initial imbalance was negative[9]. In 1990-91, the difference between inflows and outflows was relatively large and net inflows were positive. This was translated into a substantial positive impact of the initial imbalance on the change in the number of DSP recipients in the 1990s. For this reason, the impact estimate may be sensitive to the choice of years for fixing the inflow and outflow rates. Different choices of starting and ending years were tested and they did not affect the relative importance between the inflow and outflow rate.

Table 2.1: Impacts of changes in the inflow and outflow rates and population on the change in DSP recipients by period

	Change in recipients (,1000)			
Impact from	**1971-1980(a)**	**1981-1990(b)**	**1991-1999(c)**	**1971-1999(a)**
Initial imbalance*	1.10	-32.85	83.74	1.26
Population change	17.20	14.96	18.10	69.50
Inflow rate change	33.04	81.02	113.31	161.00
Outflow rate change	39.76	25.18	24.85	146.20
Actual increase	95.17	94.77	243.23	443.40

* This impact is due to the fact that even if the inflow and outflow rates and population were fixed, the number of recipients could still change (see equation (2.8)).

(a) For periods 1971-1980 and 1971-1999, the inflow rate and/or the ouflow rate was fixed at the 1970-71 level.

(b) For period 1981-1990, the inflow rate and/or the ouflow rate was fixed at the 1980-81 level.

(c) For period 1991-1999, the inflow rate and/or the outflow rate was fixed at the 1990-91 level.

The growth of population was steady and this produced a stable and relative small impact over the three periods. For the whole period 1971 to 1999, an increase of

[9] Mainly due to policy change in 1980 (see next section and Chapter 3), the inflow rate in the year 1980-81 was very low. In contrast, in 1980-81 the outflow rate was relatively high compared with that in other years during this decade. The change in the number of DSP recipients when the inflow and outflow rates and population were fixed is therefore negative (–32,850).

69,500 in the number of DSP recipients could be attributed to population growth, which was 16 percent of the actual increase in the number of DSP recipients over this period.

The impact of changes in the inflow rate was positive and had increased substantially over the last three decades. The impact in the second decade was double that in the first decade and the impact in the third decade was 1.4 time that in the second decade. Over the period 1971 to 1999, an increase of 161,000 in the number of DSP recipients could be attributed to the change in the inflow rate, which was 36 percent of the actual increase in the number of DSP recipients over this period.

The impact of change in the outflow rate was steady during the 1980s and 1990s. But in the 1970s, the impact of the change in the outflow rate was relatively large. From Figure 2.5, the fall of the outflow rate in the 1970s was substantial, while the fall was small during the other two decades. For the whole period 1971 to 1999, an increase of 146,200 in the number of DSP recipients could be attributed to the change in the outflow rate, which was 33 percent of the actual increase in the number of DSP recipients.

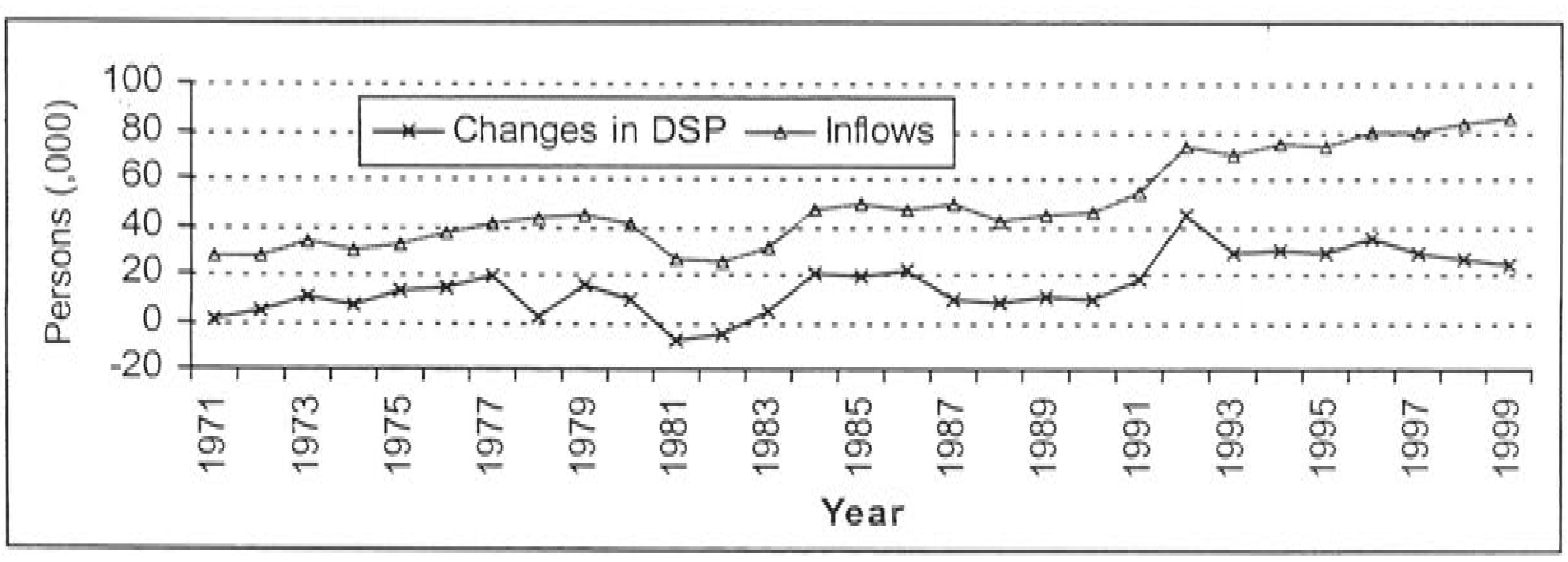
During two of the last three decades and the three decades as a whole, the impact of the change in the inflow rate exceeded that of the outflow rate. During 1981-1990, the impact of the change in the inflow rate was 3 times that of the outflow rate change. During 1991 to 1999, the impact of the inflow rate change was 4.6 times that of the outflow rate change. Only during the first decade did the impact of the change in the outflow rate exceed that of the inflow rate.

It is interesting that the variation of the inflow rate from decade to decade was larger than the variation of the outflow rate and that the impact of the inflow rate change was more important than duration change (or the outflow rate change). It seems common across nations that changes in disability benefit policy are normally targeted at inflows rather than outflows. Over the last three decades in Australia, almost all policy changes were targeted at influencing inflows even though the full impact of a change in inflows on the number of DSP recipients takes a long time to complete. If the concern of the government were that there were too many DSP recipients, it would seem that the most effective way to deal with this would be to cut off the recipients directly (i.e. by raising outflows) rather than to direct policy to inflow reduction only. This measure was probably not taken because, once a person is granted benefit, it is very hard to move them off the program unless the person would like to go. Once granted the benefit, few people are willing to leave, partially because of their effort to establish their eligibility, partially because of the depreciation of their human capital while on the DSP benefit and partially as a result of the level of their disability.

There also may be political reasons why governments target inflows rather than outflows. Current DSP recipients are recognized as disadvantaged people by the community, while potential new applicants are not directly recognizable. So, tightening eligibility criteria for potential applicants may be more acceptable to the public than moving current recipients off the program by changing the eligibility criteria. The strong opposition by the public to the current government's proposal in the 2002-2003 Budget to apply tighter eligibility criteria to current DSP recipients is a good example in this regard.

For these reasons, changes in the number of DSP recipients and variations in the level of inflows show a close association over the last three decades (see Figure 2.6). In the next section, the focus is on examining the reasons for the change in inflows and the inflow rate.

Figure 2.6: DSP inflows and changes in the number of DSP recipients, 1970-71 to 1998-99



2.3. Determinants of inflows and the inflow rate

It has been suggested that economic and non-economic factors contribute to the growth of the disability benefits program through the demand and supply sides (Stapleton, 1995). Economic factors may include the financial attractiveness of the value of the disability benefit, usually represented by the replacement rate defined as the ratio of the value of the benefit to potential labour market outcomes (i.e. earnings or wages). Labour market conditions (reflecting the business cycle as well as changes in economic structure) and the availability and values of other benefit programs are also likely to be important. Growth in population, changes in population structure, and changes in policy rules may be referred to as the main non-economic factors.

To calibrate the impact of each of these factors within a general framework requires an econometric methodology which is left for the next chapter. Here, graphical techniques are used to explore the association between the changes in these factors and the change in the inflow rate. The factors are discussed one by one[10].

2. 3.1. Financial attractiveness of DSP benefit

High rates of benefit reduce the opportunity cost of participating in the program and raise an individual's incentive to apply for the benefit. Studies conducted for other countries, especially in the US, provide supporting empirical evidence in this regard. Table 2.2, from Bound and Burkhauser (1999), presents the estimated elasticity of disability benefit applications and awards with respect to benefit levels from different studies in the US. The elasticity ranges from 0.2 to 1.3, depending on study. But, most research estimates the elasticity to be less than 0.6.

[10] Possible impacts of changes in availability and values of other benefits are discussed in Appendix 2B.

Table 2.2: Elasticity of Social Security Disability Insurance (SSDI) applications and awards with respect to benefit levels

Study	Data	Elasticity	Period/sample
Applications			
Aggregate time series data			
Halpern (1979)	US quarterly	0.4	1964-1978
Lando et al (1979)	US quarterly	0.4-0.6	1964-1978
Cross-sectional micro data			
Bound (1987)	SDNA*	0.2	Men, aged 45-59, 1972
Halpern and Hausman (1986)	SDNA*	1.3	Men, less than age 50, 1972
Kreider (1986)	SDW**	0.8	Men, aged 45-59, 1978
Awards			
Aggregate cross-sectional time series data			
Black et al. (1998)	County data	0.3-0.4	KY, OH, PA, WV counties, 1970-1993
Cross-sectional micro data			
Leonard (1979)	SDNA*	0.35	Men, aged 45-54, 1972

* 1972 Social Security Survey of Disabled and Non-disabled Adults.

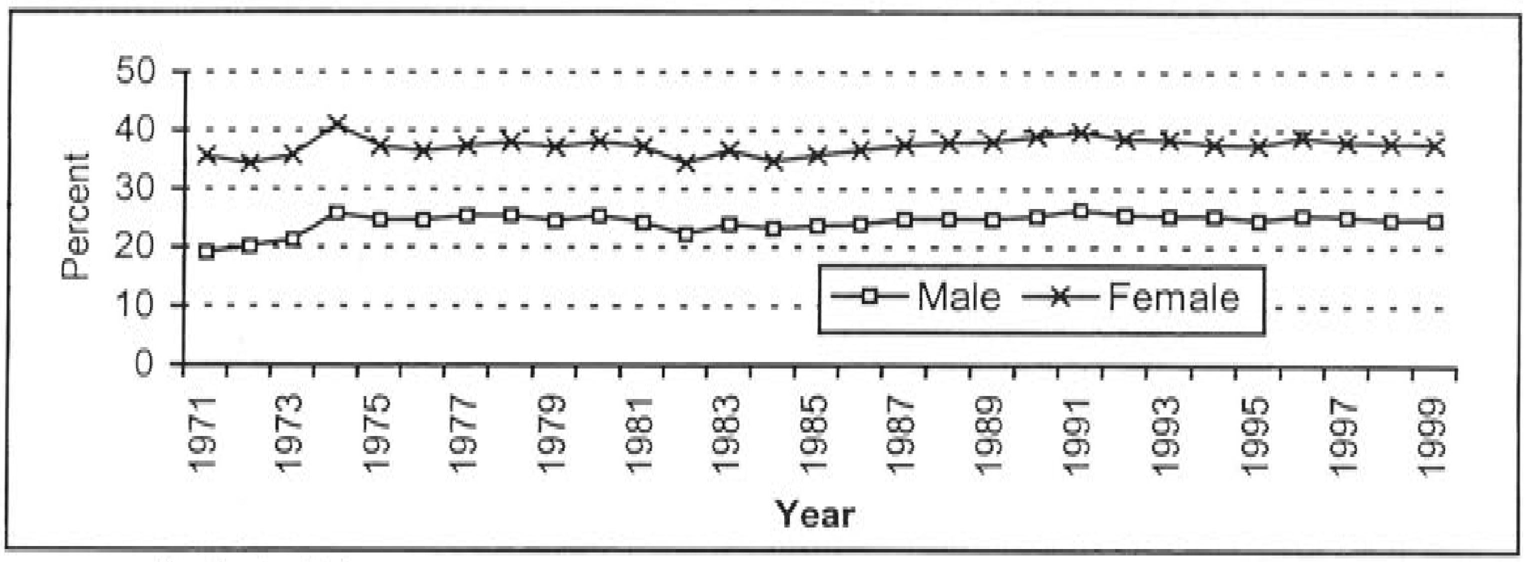
**1978 Social Security Survey of Disability and Work.

Source: Bound and Burkhauser (1999) Table 13.

The determination of the DSP benefit level in Australia is quite different from other industrialized countries in that the DSP benefit is a universal flat rate and not related to previous work experience or the individual's earning history. In addition, as shown in Figure 2.7, the ratio of the maximum single pension rate to the average total weekly earnings[11] did not change much over the period 1971 to 1999. In fact, the ratio appeared to decrease marginally from 1992 when the inflow rate sharply increased.

[11] The pension rate in June each year is taken from the DSS (FaCS) *Annual Report.* Male average total weekly earnings (AWE) is taken from *Average Weekly Earnings, Australia, ABS 6303.0.* Up to 1981 June quarter data is used for each year and after 1981 the May quarter is used. Up to 1983 female earnings was derived from the male rate using AWE figures at December each year, from *Australian Historical Statistics*, Vamplew (1987, p157). From 1983 female AWE iss taken from *ABS 6302.0.*

Figure 2.7: Ratio of the maximum single pension rate to the average total weekly earnings, 1971 to 1999



Source: see footnote 11.

Therefore, even if the effect of the benefit level was correctly estimated by the above studies, it is still doubtful whether we can expect the change in the value of the benefit to explain very much of the increase in the number of the DSP recipients in Australia[12]. From 1971 to 1999, the ratio of the single pension rate to the average total weekly earnings of males increased by 30 percent (this ratio increased less for females). Even if we take the biggest estimated elasticity, 1.3, we would only have expected the number of DSP grants to increase by 40 percent from 1971 to 1999, an increase of 11,000 recipients, but the grants actually increased by 213 percent, an increase of 58,300. Also note that the increase of the relative benefit mainly occurred before 1975, but the sharp increase of DSP inflows mainly took place during the early 1980s and early 1990s.

2.3.2. Labour market conditions

It is often argued that an economic recession may lead to an increase in the number of new DSP recipients (i.e. inflows). The main reason is that during economic downturns

[12] Note that the benefit-earnings ratio would be different for different individuals. The benefit-earnings ratio would be larger for low paid workers and smaller for high paid workers. As suggested in the literature, wage dispersion has increased over the last two to three decades. This implies that the benefit-earnings ratio has risen for low paid workers. Since the disabled are more likely to hold positions with low wages, although the ratio of benefit to average weekly total earnings did not change much, the ratio of benefit to the earnings of the disabled workers might have increased.

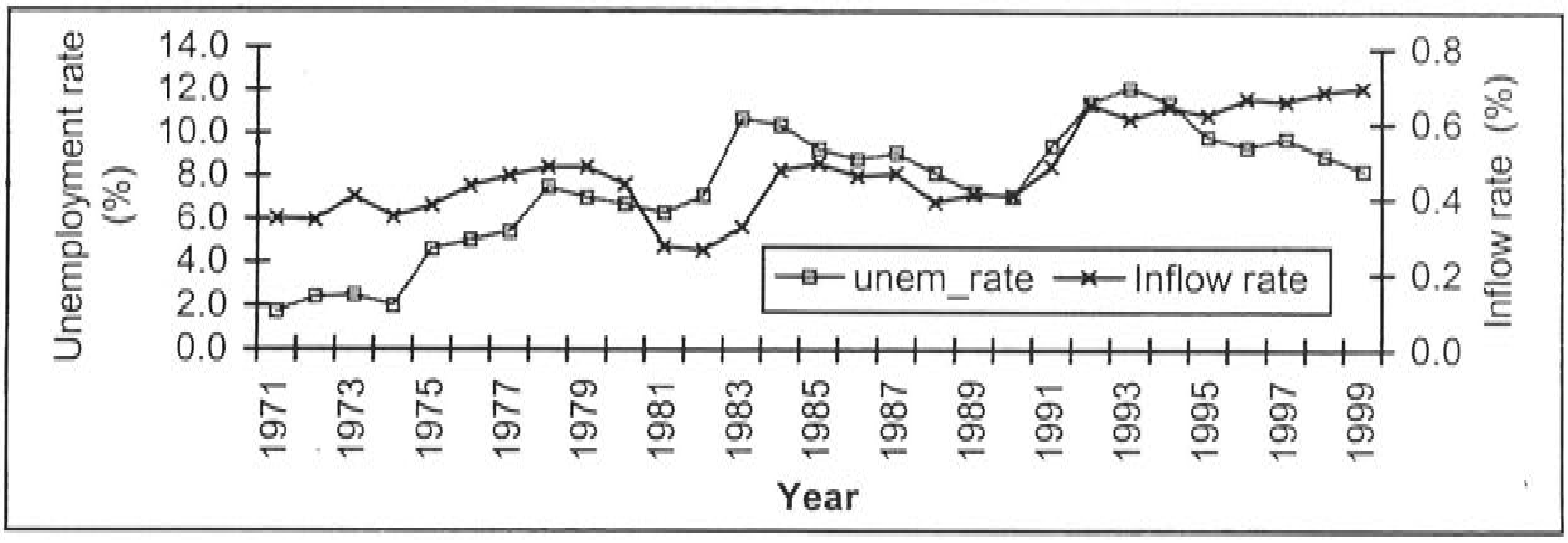
the probability of application for DSP benefit increases. On the one hand the probability of becoming unemployed is higher for a disabled than for a healthy worker; on the other hand, it is more difficult for disabled people to find jobs. Both imply a lower opportunity cost of applying for DSP (Autor, 2001). Moreover, the effect of a recession can be accommodated by the administrative authority if the high unemployment rate is of political concern for the government[13]. Unemployed people in a disability program attract less political attention.

Studies conducted in the US have found marked effects of an adverse labour market shock on the number of applications and awards of disability benefits (Lando, Coate and Kraus, 1979; Stapleton, 1995). Disney and Webb (1991) and Piachaud (1986) also found significant effects of the unemployment rate on the increase in the incidence rate of disability benefit recipients in Britain.

As for Australia, Figure 2.8 plots the inflow rate and the unemployment rate over the period 1971 to 1999. There was a close association between these two series at least before 1993. But whether there is a causal relationship is not clear because the close association between the two series in the 1970s and 1980s was accompanied by changes in policy, and the ease in labor market conditions (as indicated by the fall in the unemployment rate from 1993) did not lead to a decrease in the inflow rate of DSP recipients. This may be because population ageing had started to have an impact as shown in Figure 2.11.

[13] See Chapter 3 for detailed discussion on the impact of labour market conditions on DSP applications and grants.

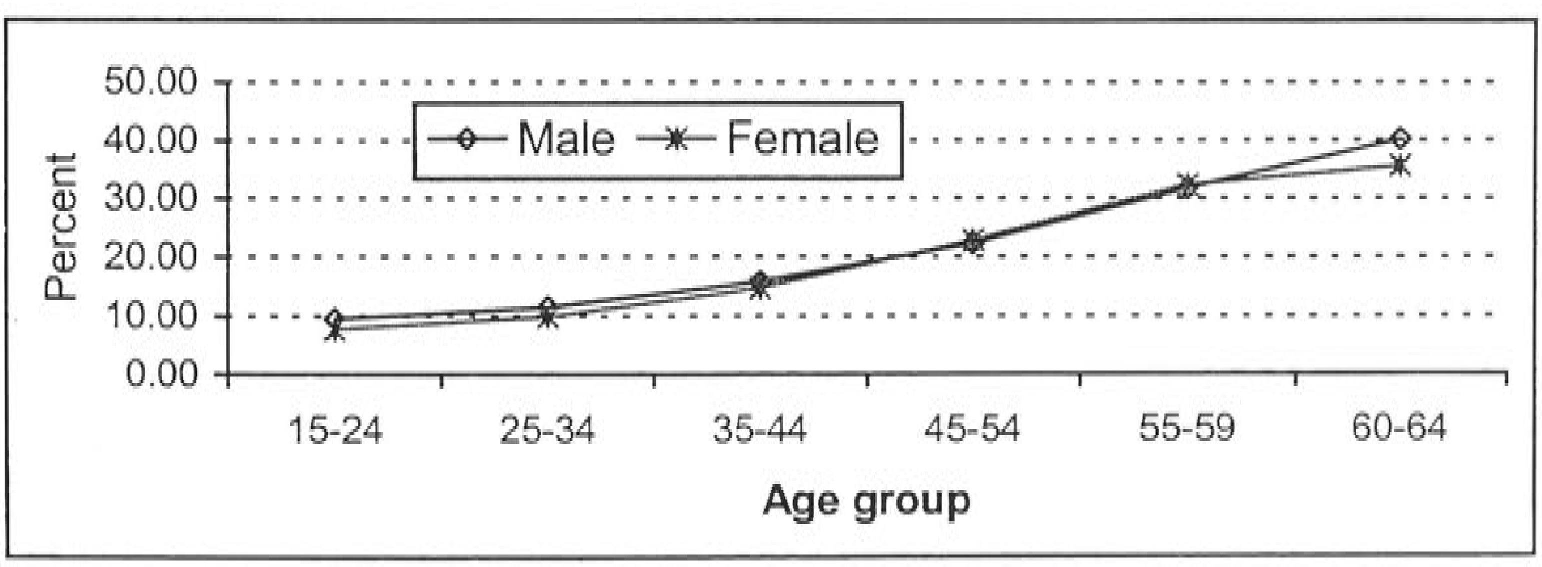
Figure 2.8: DSP inflow rate and the unemployment rate[14], 1971 to 1999



2.3.3. Change in population structure

An increase in the eligible population increases inflows of DSP recipients because the number of persons with disability may increase. Changes in population structure may change the inflow rate even if the population remains constant because the incidence rate of disability is increasing with age (see Figure 2.9) and the inflow rate for the older age population is higher (see Figure 2.10 and Figures 2.A1 and 2.A2 in Appendix 2A).

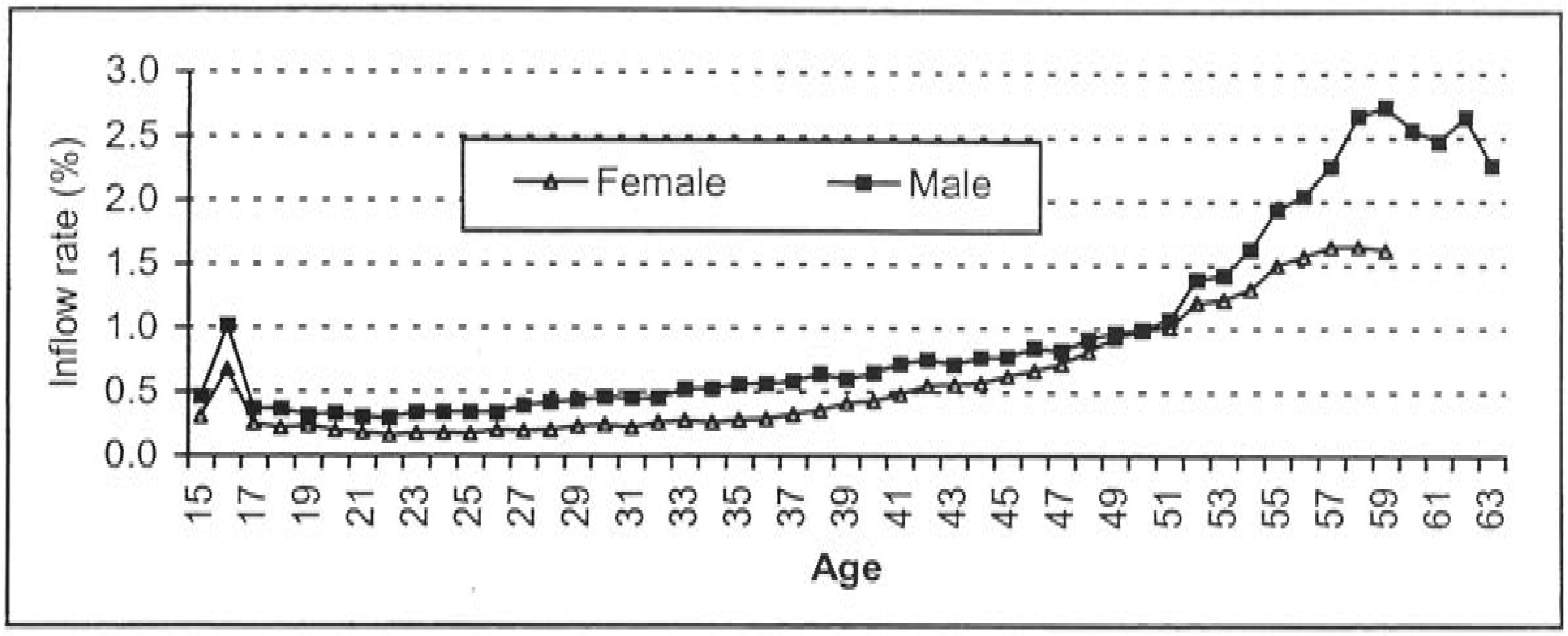
Figure 2.9: Population disability rate by age and gender, 1998



Source: *Disability, Ageing and Carers Survey (1998), ABS 4430.0.*

[14] The unemployment rate was in February each year and taken from *Labour Force, Australia, ABS 6202.0.*

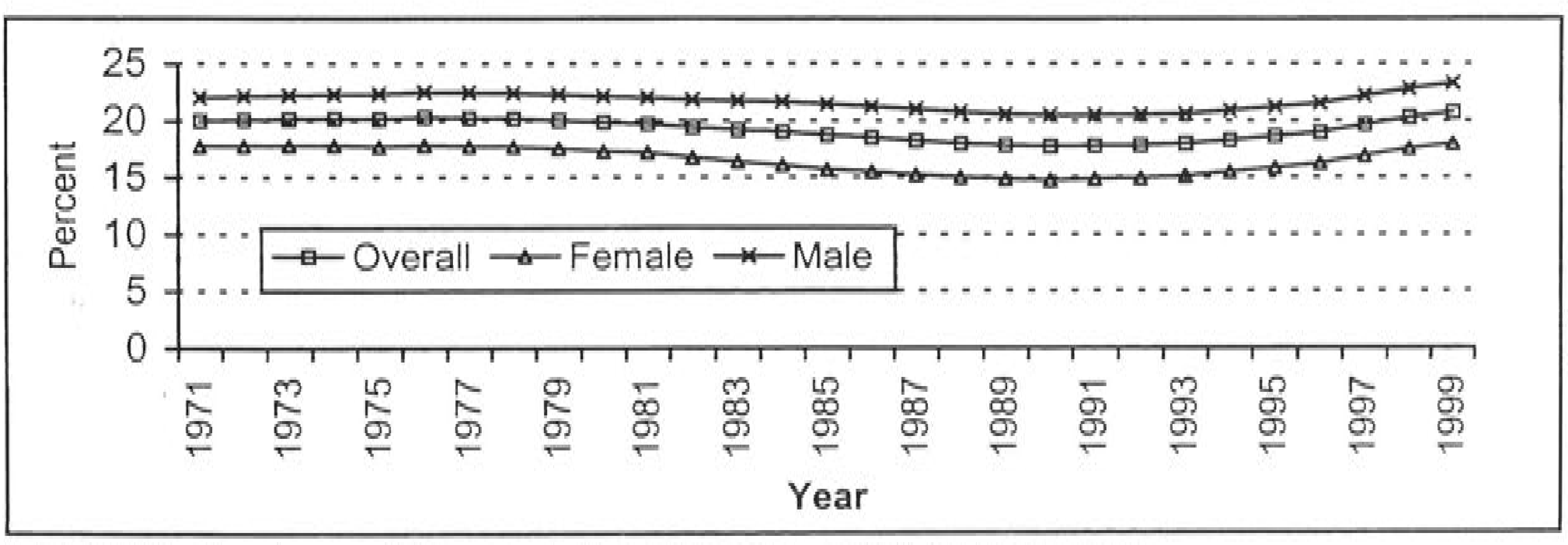
Figure 2.10: The inflow rate by age and gender, 1998-99



Source: DSP inflows by age were estimated by the author from the FaCS full LDS data.

It is often argued that population aging contributed to the growth in the DSP program in Australia. However, while both the number of DSP recipients and the ratio of the number of DSP recipients to the DSP age eligible population have been increasing from 1971 (except for the early 1980s), the proportion of the male population aged 50 to 64 and the female population aged 50 to 59 to the DSP age eligible population decreased for about ten years prior to 1991 (Figure 2.11[15]).

Figure 2.11: Ratio of population aged 50-64/59* to the DSP age eligible population



* 50-64/59 refers to population aged 50-64 for males and 50-59 for females.

[15] For more detailed population structure changes, see Figure 2.A5 and 2.A6 in Appendix 2A.

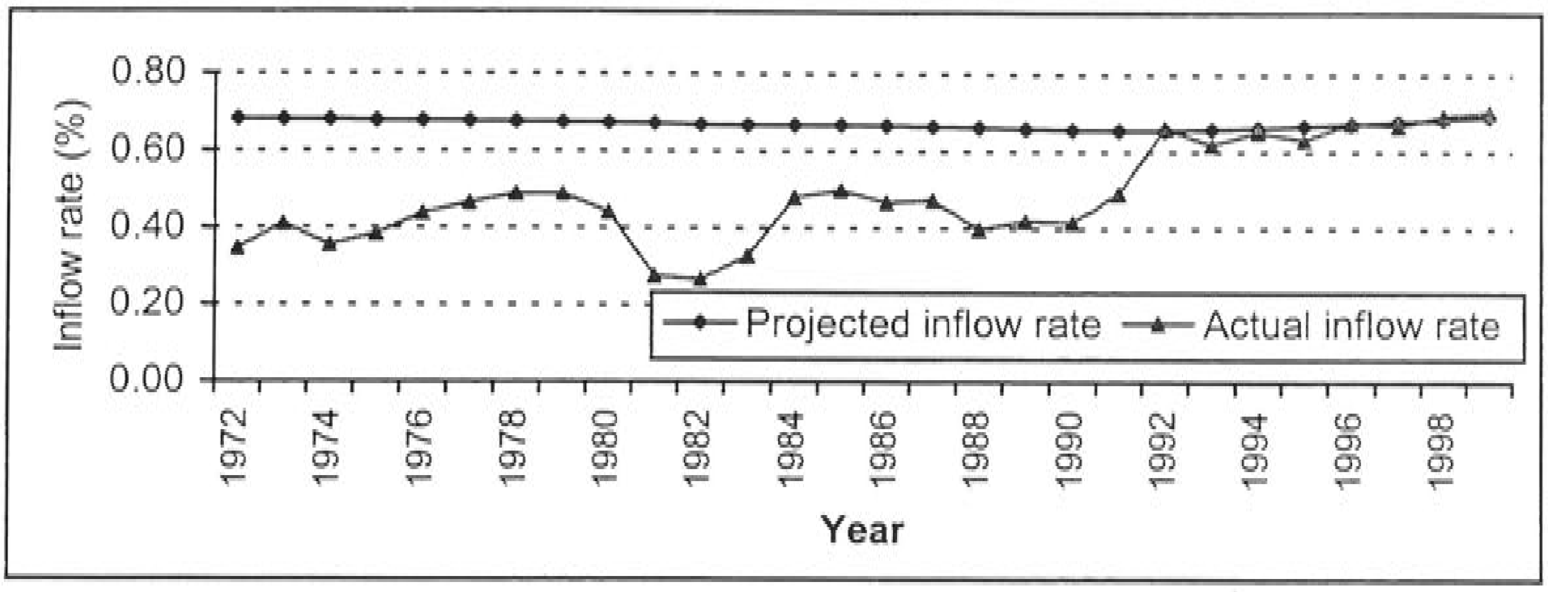
Therefore, if anything, the change in population structure should have pulled down the inflows of DSP recipients during the 1980s. Jackson (1999) showed that until 1997, population ageing had a negative effect on the numbers of males receiving DSP.

One way to assess the effect of changes in population structure on the inflow rate is to keep the age specific inflow rate fixed and allow the population structure to change to see what happens to the overall inflow rate. Figure 2.12 presents this calculation using 1995-96 age specific inflow rate[16]. The projected inflow rate is very smooth with little change. By 1991 the projected inflow rate was decreasing, implying population structure changes up to 1991 had a negative impact on the overall inflow rate. Only from 1992 did the population structure changes start to have a positive impact on the overall inflow rate. But, this impact is very small compared with the increase of the actual inflow rate. Over the period 1991 to 1999, the projected inflow rate increased by 0.037 percentage points, while the actual inflow rate increased by 0.21 percentage points and from 1991 to 1992 it increased by 0.17 percentage points. Therefore, the impact of change in population structure on the inflow rate for the last three decades might be negligible.

The actual inflow rate is also plotted in Figure 2.12 for comparison. What is impressive in the comparison is the large difference between the projected inflow rate and the actual inflow rate before 1991. Although data are not available for direct derivation of the age specific inflow rate for the years before 1991, the comparison suggests that the age specific inflow rate before 1991 must have been much smaller than that in 1996. This comparison also confirms the observation in section 2 that it was the change in the inflow rate that led to the dramatic increase in the number of DSP recipients.

[16] The age specific inflows for 1995-96 were derived by the author from the FaCS full LDS data. See Figure 2.A1 and 2.A2 in Appendix 2A for the age specific inflow rate by gender and for the other three financial years. For comparison the outflow rate by age and gender is also presented in Figure 2.A3 and 2.A4 in Appendix 2A.

Figure 2.12: Projected DSP inflow rate using 1995-96 age specific inflow rate



2. 3.4. Changes in policies

Changes in policies include changes in the eligibility rules and the level of benefits. As benefit level changes have been discussed earlier, the focus here is on changes in eligibility criteria for DSP benefits. As noted earlier, over the last three decades there were three important occasions when changes in eligibility criteria took place:

- *1980 - Tightening the eligibility rule.* In response to concerns as to the liberalized interpretation of the criteria of 85 percent permanent incapacity, which was believed to have at least partly caused the rapid increase in the number of DSP recipients before 1980, the administrative authority tightened the eligibility rule by putting greater emphasis on medical factors. The legislative eligibility criteria did not change at this time, but the interpretation of the criteria and the focus of the assessment process were changed. However, the impact of this change might not be negligible since inflows and the inflow rate did experience a dramatic decrease from 1980. But this new policy did not last long. There was considerable criticism of this change and with the change of government in 1983, socio-economic factors were again allowed to play a considerable role in the assessment process (Cass, Gibson and Tito, 1988)[17]. Consequently, the inflow rate rebounded to the previous level by 1984-85.

[17] For detailed accounts of this change, see Cass, Gibson and Tito (1988).

- *1987 - Introduction of the proportion of incapacity caused by impairment.* This change was to ensure that payment of disability benefit was based on impairment as the cause of incapacity rather than the effect of one or more social-economic factors. In addition to the criteria of at least 85 percent of the permanent incapacity for work, the requirement was added that 50 percent of that incapacity be caused directly by a physical or mental impairment. As discussed earlier, the effect of this policy change was relatively small.

- *1991 - Introduction of the Disability Reform Package (DRP) in November.* With the introduction of the DRP the eligibility criteria were changed to: (i) introducing a minimum impairment threshold of 20 percent; (ii) replacing the concept of 85 percent permanently incapacitated for work by an inability to work for at least 30 hours a week at full award wages for at least the next two years, due to a physical, intellectual or psychiatric impairment[18](DSS, 1992).

These changes may be quite complicated in terms of their effect on DSP inflows. One objective of the DRP was to "reduce long-term total dependence on income support" (DSS, 1992). This can probably be interpreted as tightening the eligibility criteria for DSP. However, compared with 50 percent of impairment introduced in 1987, the adoption of the minimum impairment requirement of 20 percent in 1991 could be regarded as a relaxation of the eligibility criteria. As for the replacement of 85 percent of permanent incapacity for work by an inability to work for at least 30 hours a week, it is hard to make a judgment because there was no requirement like this before. But this can be compared with a similar requirement in the US disability benefit program. In the US, if a disabled person can engage in work that earns a *substantial gainful activity* (SGA) amount, the person automatically loses the Social Security Disability Insurance (SSDI) benefit. In 1997, the SGA amount was US$500 per month (Hu, Lahiri, Vaughan and Wixon, 1997). If a person earns the minimum wage, US$5.15 per hour, the SGA amount is equivalent to about 24 hours of work per week. Thus the 30 hours per week requirement may be generous.

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[18] As before, permanently blind persons are automatically eligible for IP or DSP.

It is evident that large inflows and the inflow rate responses were associated with these policy changes, especially for the 1980 and 1991 policy changes. However, while the policy changes in 1980 and 1987 helped reduce inflows and the inflow rate, the changes in 1991 were associated with a sharp increase.

These discussions suggest that, while other factors such as the changes in other income support benefits may have had some marginal impact on the increase in the inflow rate, the most important factors seemed to be the changes in policies and labor market conditions. This is confirmed by the empirical tests in the next chapter, where it is shown that labor market conditions represented by the unemployment rate and the changes in policies had significant impacts on the applications and grants of DSP benefits. The impacts of changes in population structure and the ratio of the disability benefit rate to the average weekly earnings on the inflow rate were not significant.

2.4. Conclusion

The DSP program has grown rapidly over the last three decades both in terms of the number of DSP recipients and the ratio of DSP recipients to the DSP age eligible population. The increase in DSP recipients was much larger in the 1990s than in previous two decades. Analyzing this growth in an inflow-outflow framework showed that, while both the increase in the inflow rate and decrease in the outflow rate have contributed to the program growth, the data imply that increases in the inflow rate contributed more than decreases in the outflow rate over the period 1971 to 1999. Over the whole period, over 36 percent of the increase in the number of DSP recipients could be attributed to the change in the inflow rate, while 33 percent could be attributed to the change in the outflow rate and 16 percent could be attributed to the growth of population.

When examined by decade, it appeared that the impact of population change on the increase in DSP recipients was relatively stable for the last three decades. The results also showed that the contribution of the change in the inflow rate to the increase in the number of DSP recipients was more important during 1980s and 1990s. During the 1980s, the impact of the change in the inflow rate was 3 times the impact of the change in the outflow rate. During the 1990s it was 4.6 times the impact of the change in the outflow rate and during the 1970s it was a little smaller than the impact of the change in the outflow rate.

Because the variation of the inflow rate was much larger than the variation of the outflow rate and the change in the inflow rate contributed more to the increase in the number of DSP recipients than the change in the outflow over the period 1971 to 1999, the factors that determine the inflow rate were further examined. Among the factors that determine DSP inflow rate, the time series data suggested that the changes in policy which altered the eligibility criteria for DSP benefits and changes in labour market conditions played the most important roles. The impact of the relative benefit level and changes in the population structure seemed not to be important. The impacts of these factors are formally examined in the next chapter.

It is not clear how the 1991 policy change affected the composition of DSP inflows. If this change attracted more older people to the DSP, the impact of the new policy on the number of DSP recipients was smaller than if it attracted more young people, because as will be shown in Chapter 6, younger recipients stay on the program longer than older recipients.

Another important point to note is that the impact of change in inflows on the number of DSP recipients is long lasting and is determined by the completed duration of the recipients. While the variation in the inflow rate reflected the policy changes over the last three decades, the outflow rate was relatively smooth (although with a decreasing trend) because the outflow rate is mainly determined by the duration composition of recipients and there have been few policy changes aimed directly at outflows.

Appendix 2A

Figure 2.A1: DSP inflow rate by age, male

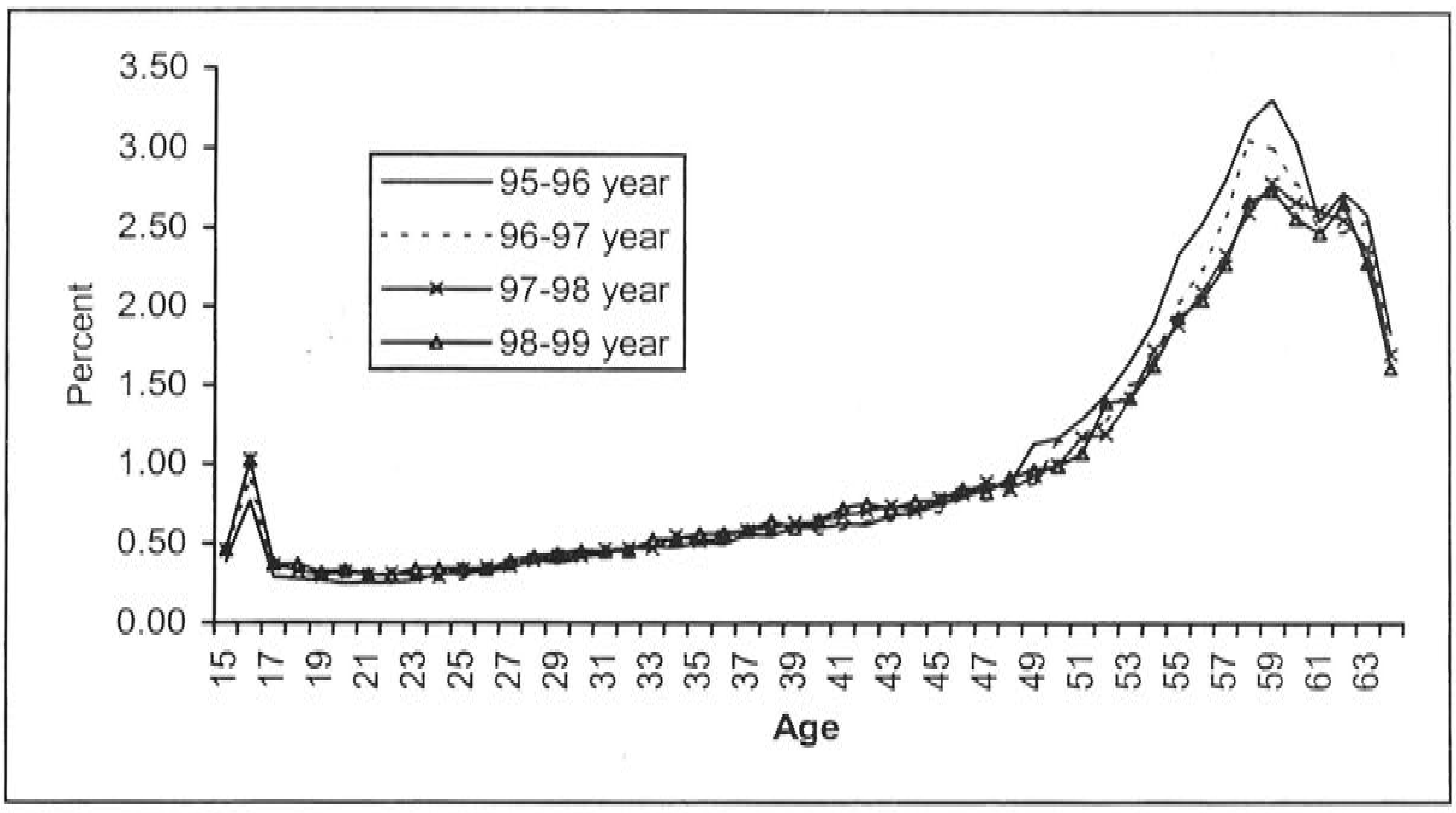


Figure 2.A2: DSP inflow rate by age, female

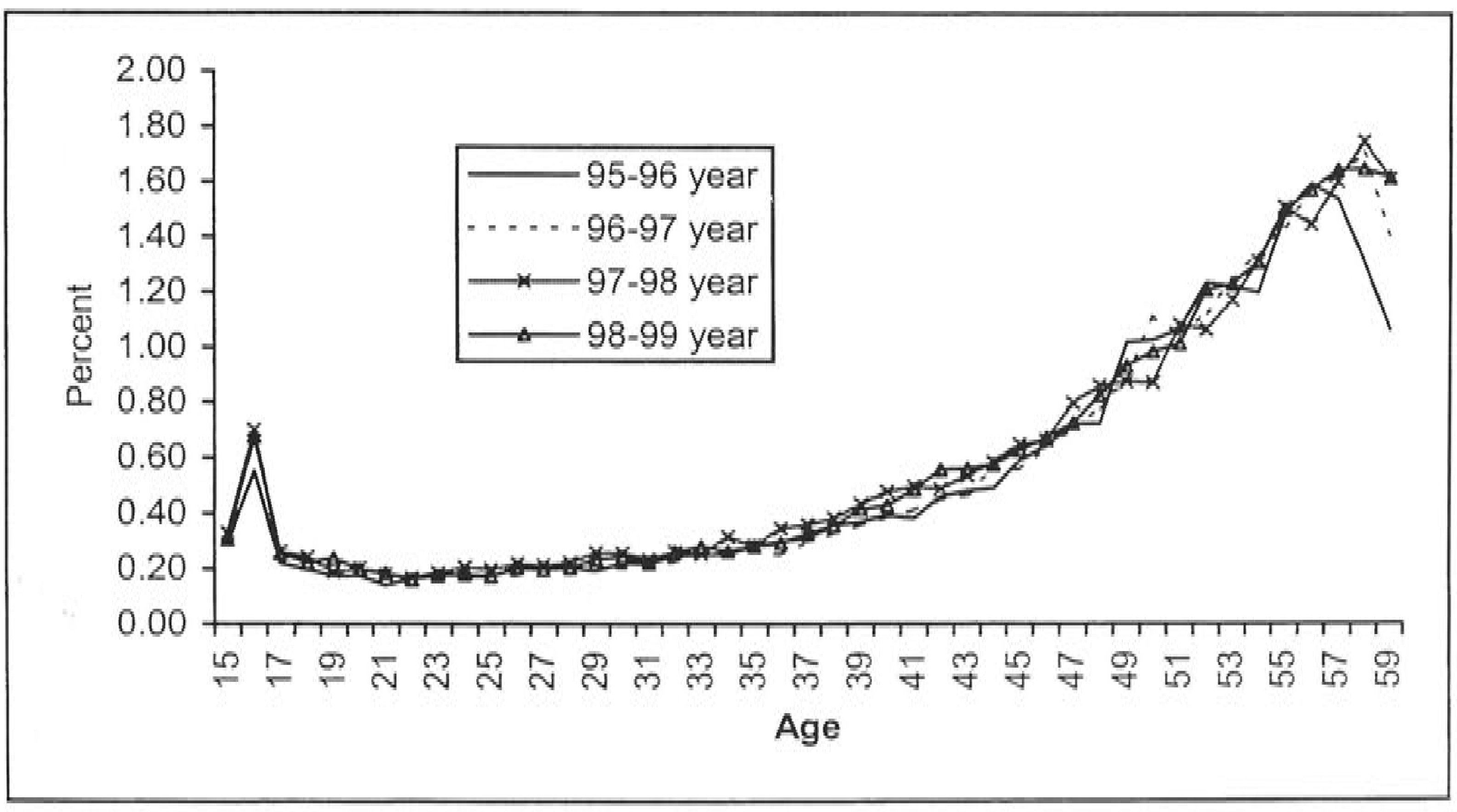


Figure 2.A3: DSP outflow rate by age, male

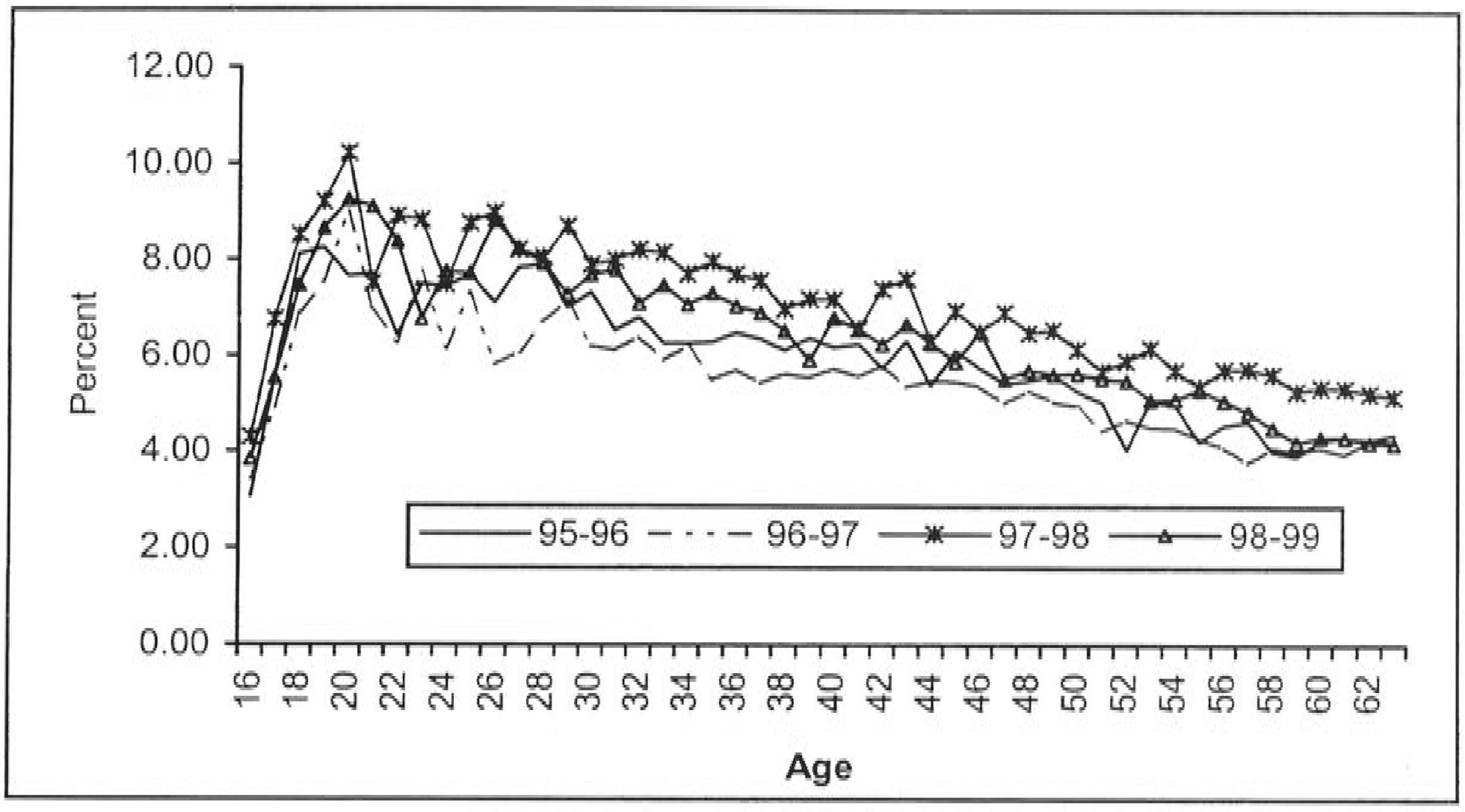


Figure 2.A4: DSP outflow rate by age, female

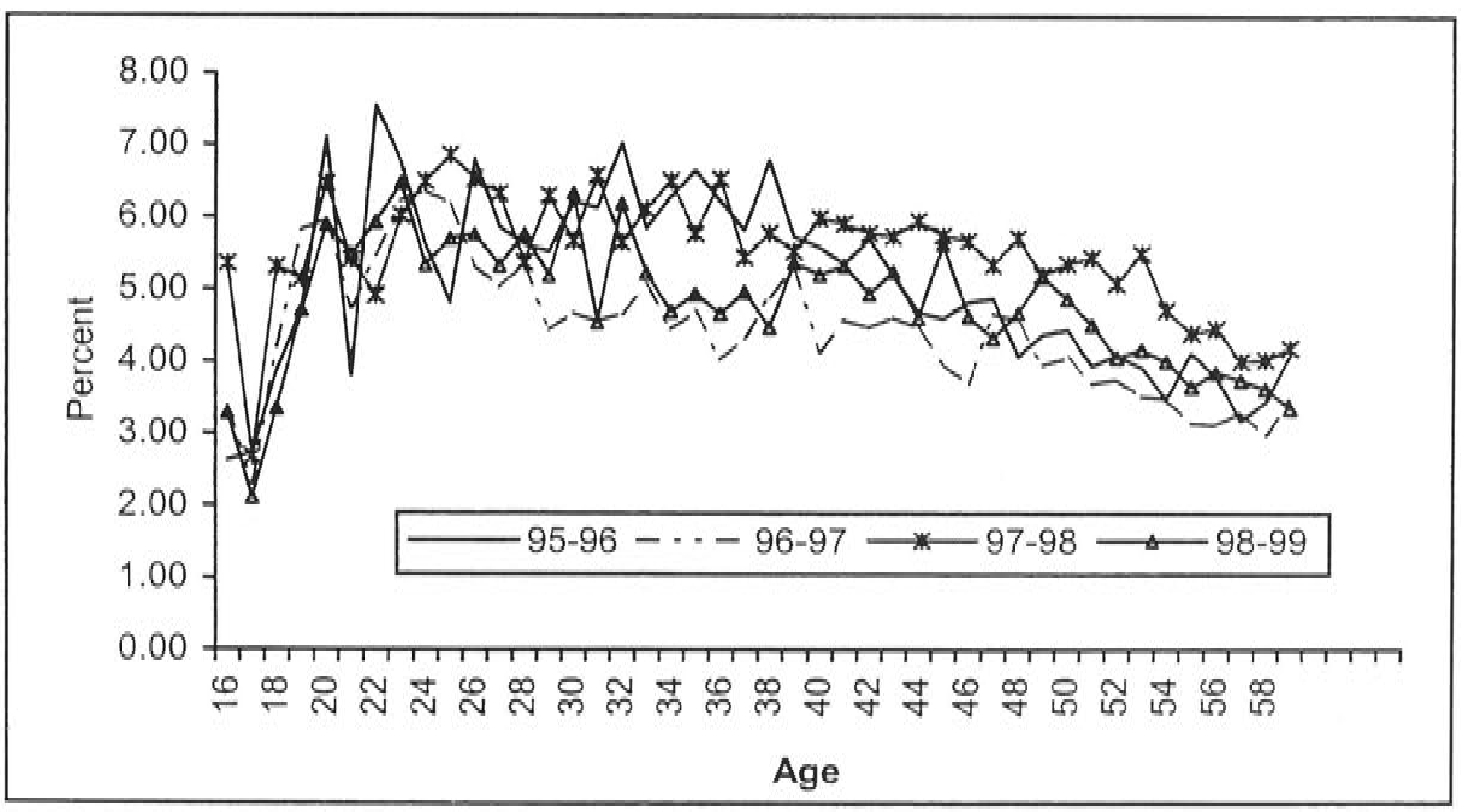


Figure 2.A5: Population structure changes 1971 to 1999, male

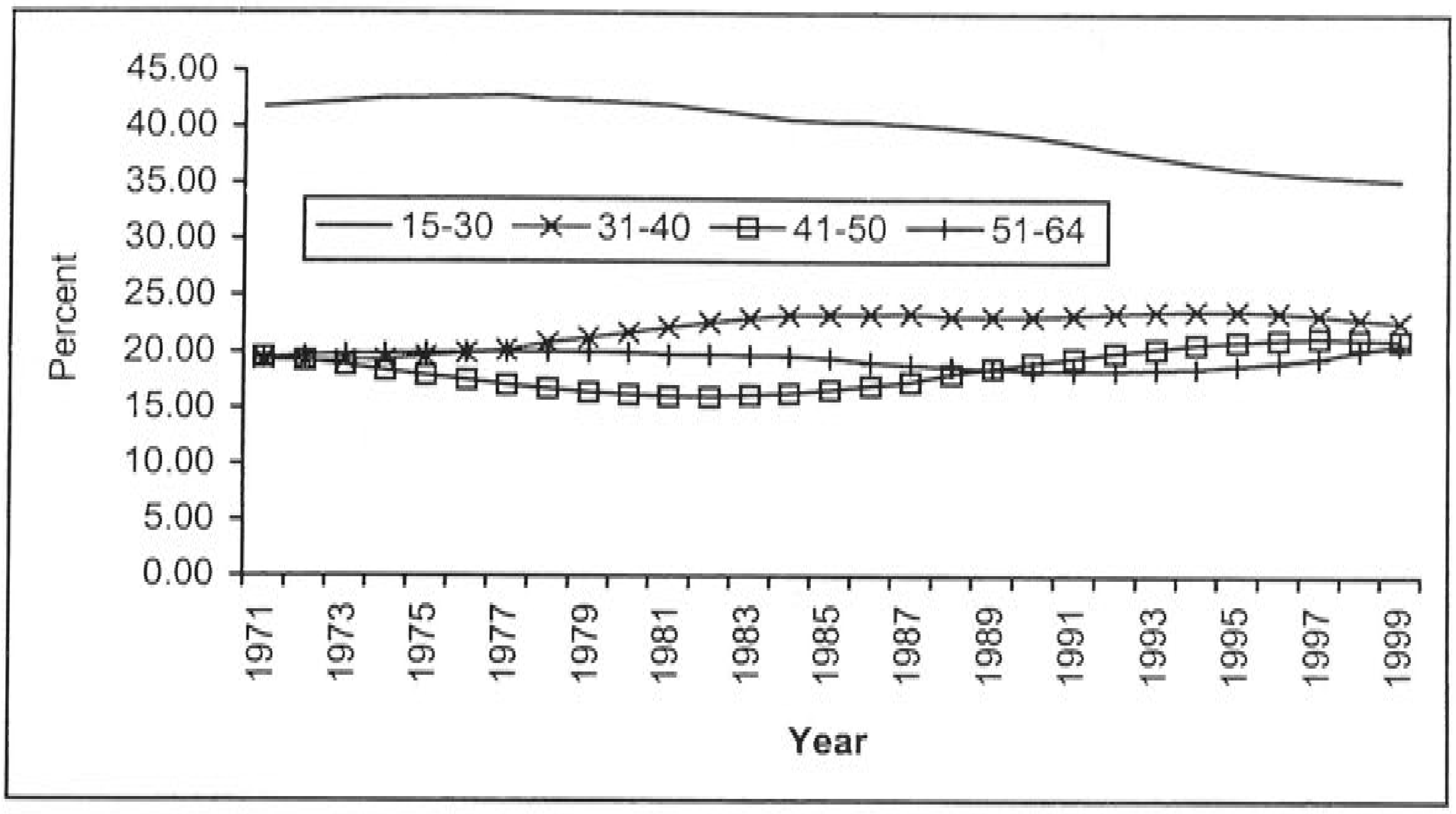
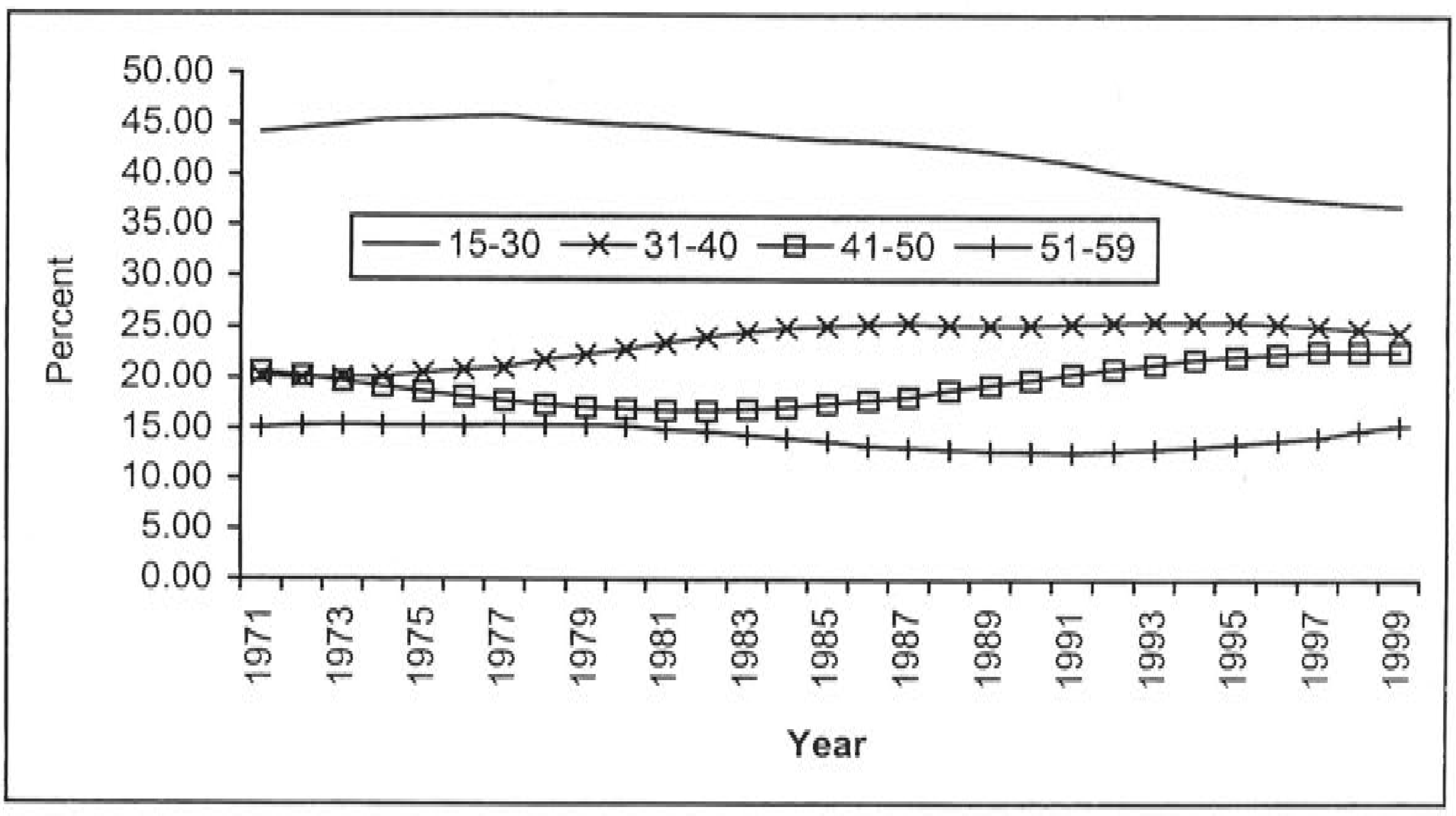


Figure 2.A6: Population structure changes 1971 to 1999, female



Appendix 2B

Impacts of changes in other benefit programs on DSP inflows

Other benefit programs can be classified as either "substitutes" or "complements" for DSP. Substitute programs are those for which an expansion in the value of benefits reduces applications and grants for DSP, while benefit expansions for complementary programs increase applications and grants for DSP (Stapleton, 1995). Pension Concession Card, Rent Assistance, and Family Payments are examples of complementary benefits. All the other social security benefits are substitutes in the sense that DSP recipients are not eligible for them while receiving DSP. Since the changes in complementary benefits are negligible, only the substitute benefits are discussed.

Also note that, in Australia, the main income support payments available to working age men and women are quite different. For men the available benefits include unemployment (or related) benefits, DSP, and sickness benefits/allowance. However, women have access to a wider range of income support payments. These include wife pension/partner allowance, widow pension (different types), and sole parent pension[19]. This difference in availability of income support payments between men and women may partly explain the gender imbalance amongst DSP recipients as shown in earlier figures.

Changes in the availability of other benefits programs that may contribute to the growth in DSP include:

- *Sickness benefits/allowance*. There were policy changes to contain the increase in the number of sickness benefit recipients prior to 1991[20]. In 1991 dramatic changes in this benefit took place with the introduction of the Disability

[19] For a detailed description of the payments programs and their developments, see Bond and Whiteford (2000).

[20] See Cass, Gibson and Tito (1988) for the efforts before 1988.

Reform Package (DRP). This might have led to the increase in DSP inflows. With the introduction of DRP, Sickness Benefit was replaced by Sickness Allowance (SA) and importantly SA is generally limited to 12 months, with an extension to 24 months in special circumstances. As shown in Table 2.A1, both in the financial year 1990-91 in preparation for the introduction of DRP and in 1991-92 the year the DRP was introduced, a considerable number of sickness benefit recipients were transferred to DSP. Most importantly, the long term effects of the imposition of a time limit on sickness benefit is that it prevents this benefit from becoming an alternative for DSP and increases the demand for the latter.

Table 2.A1: Number of sickness benefit recipients who transferred to DSP, 1990-91 to 1993-94

Year	Persons
1990-91	29082
1991-92	25954
1992-93	17990
1993-94	16659

Source: Disability Task Force (1991).

- *Widow B Pension.* From June 1987 the Widow B Pension began to be phased out. It can be assumed that many women who formerly had been eligible for Widow B Pension took up DSP and increased the inflows of DSP.
- *Eligible age for the Age Pension for women.* From January 1995, the age pension age for women was increased and a six months increase in their Age Pension age for every two years scheduled until it reaches 65. This raised the female inflows of DSP recipients over 60 years old from 1995. See Table 2.A2.

Table 2.A2: DSP inflows of females over 60 years of age[21], 1995-96 to 1998-99

Year	Persons
1995-96	208
1996-97	348
1997-98	816
1998-99	999

There are also changes in other benefit programs that may contribute to the decrease in inflows of DSP recipients, such as:

- *Mature Age Allowance* (MAA). MAA was introduced in March 1994 and is payable to men over 60 years old who were unemployed and have received income support for 12 months or more[22]. As it is easier to be granted this benefit than the DSP, it can be expected that the introduction of MAA would reduce the applications for DSP.

In addition, it is often suggested that the Service Pensions have had an effect on the number of DSP recipients. The eligible age for a service pension is five years earlier than for the age pension. Between 1974 and 1984, many more World War Two servicemen entered their service pension age and became eligible for the Service Pension. Consequently, this might have contributed to containing the increase in the numbers of DSP recipients during the late 1970s and 1980s. However, this service pension should only have had an effect on the number of DSP recipients over 60 and not on those under 60.

[21] Derived by the author from the FaCS full LDS data.

[22] Before 1 July 1996, MAA was paid at the same rates and under the same income and assets test as the Age Pension and the DSP. Subsequently MAA was paid under the allowance income and assets test to people who had been on Newstart for 9 months or any other payment (except Special Benefit or Austudy Payment) for any period, providing they had no recent workforce experience.

Chapter 3

Labour Market Conditions, DSP Applications and Grants

As economic growth faltered in the early 1970s, older workers with more or less serious impairments became targets for lay-offs and, if out of work, found obtaining a job increasingly difficult. Public officials responded by introducing relaxed eligibility criteria into disability programs, making access to them less difficult. They (disability benefit programs) become a form of extended unemployment.

- Halberstadt, Haveman and Wolfe (1981)

3.1. Introduction

Both increases in inflows and average duration on an income support payment can lead to an increase in the number of benefit recipients. As shown in Chapter 2, the inflow rate, defined as the ratio of new grants of DSP benefits to the DSP age eligible population, dramatically increased over the last three decades. The outflow rate experienced a slight decrease, which might suggest that average completed duration had increased. The past increase in the number of DSP recipients might be therefore due to increases in both the inflow rate and average completed duration.

However, as shown in the previous chapter, the increase in the inflow rate, rather than the increase in the average completed duration, had contributed more to the growth of DSP recipients, especially over the last decade. It was also shown that the change in the number of DSP recipients was closely associated with inflow variations.

This chapter examines the reasons for the change in the inflow rate, focusing on the effect of labor market conditions on the applications for, and the grants of, disability benefit in the context of program growth. It also examines the impact of labour market conditions on the authority's implementation of the decision rule to grant an application.

3.2. Theoretical issues

Participation in the disability benefit program proceeds through two steps involving two decision-makers—the disabled individuals and the program administration or the watchdog of the program. The disabled individual decides whether to apply for the benefit, given their health condition, and the administrative authority decides whether to grant the benefit. Labour market conditions may play a role in both processes.

Aarts and de Jong (1992) argue that disability behaviour is not only determined by clinical factors but is also determined by vocational factors, such as the demands of the workplace, the willingness of employers to adapt to the disabled worker's limitation and the supply of suitable jobs. Worsening labour market conditions induce a higher probability of disability benefit applications through reduced labour demand for the disabled workers and (then) discourage job seeking. Impairment of a disabled worker often reduces the worker's productivity and flexibility and makes them less competitive in the labour market. A surplus of labour supply, resulting from a recession, aggravates this competitive disadvantage. During a recession, the probability of being laid off is high for the disabled and the probability of finding a new job is low (Daly, 1994).

Other research findings show that many disabled persons have other productivity characteristics which induce a high unemployment risk, such as old age, low education and unstable work experiences. Therefore, worsening labour conditions fall disproportionately on this group and make it more difficult for disabled workers to acquire earned income. They turn to other income sources, such as the disability benefit. Hogelund (2000) labels the impact of deteriorating labour market conditions on the disability benefit application as a "push perspective". In addition, Autor (2001) argues that once the disabled workers become unemployed in the recession, their opportunity costs of applying for disability benefits become lower, a "pull perspective".

While the demand for DSP benefits will go up during an economic recession, the response of the supply side will depend on the objectives of the administrative authority (or the government). If the government wants to contain the growth of the program, it will counteract increasing applications by implementing more stringent eligibility rules. Alternatively, if measured unemployment is of great concern to the government, the administrative authority may increase benefit grants to accommodate the increasing demand. In this case the disability benefit program is used as a means to reduce the unemployment rate. The reason that the administrative authority can manipulate disability benefit program inflows in this way is that the eligibility criteria, set up by legislation, are not well defined and necessarily involve subjective interpretation. Although eligibility for a disability benefit grant often appears to be based only on medical conditions, the actual criteria allow socio-economic factors to come into the administration's decision process (Cass, Gibson and Tito, 1988).

Of course government may respond to increasing unemployment differently at different times. As discussed in Chapter 2, the policy change in 1980 might be regarded as a counteracting response to an increase in program demand, while the change in 1991 might be regarded as an accommodating response.

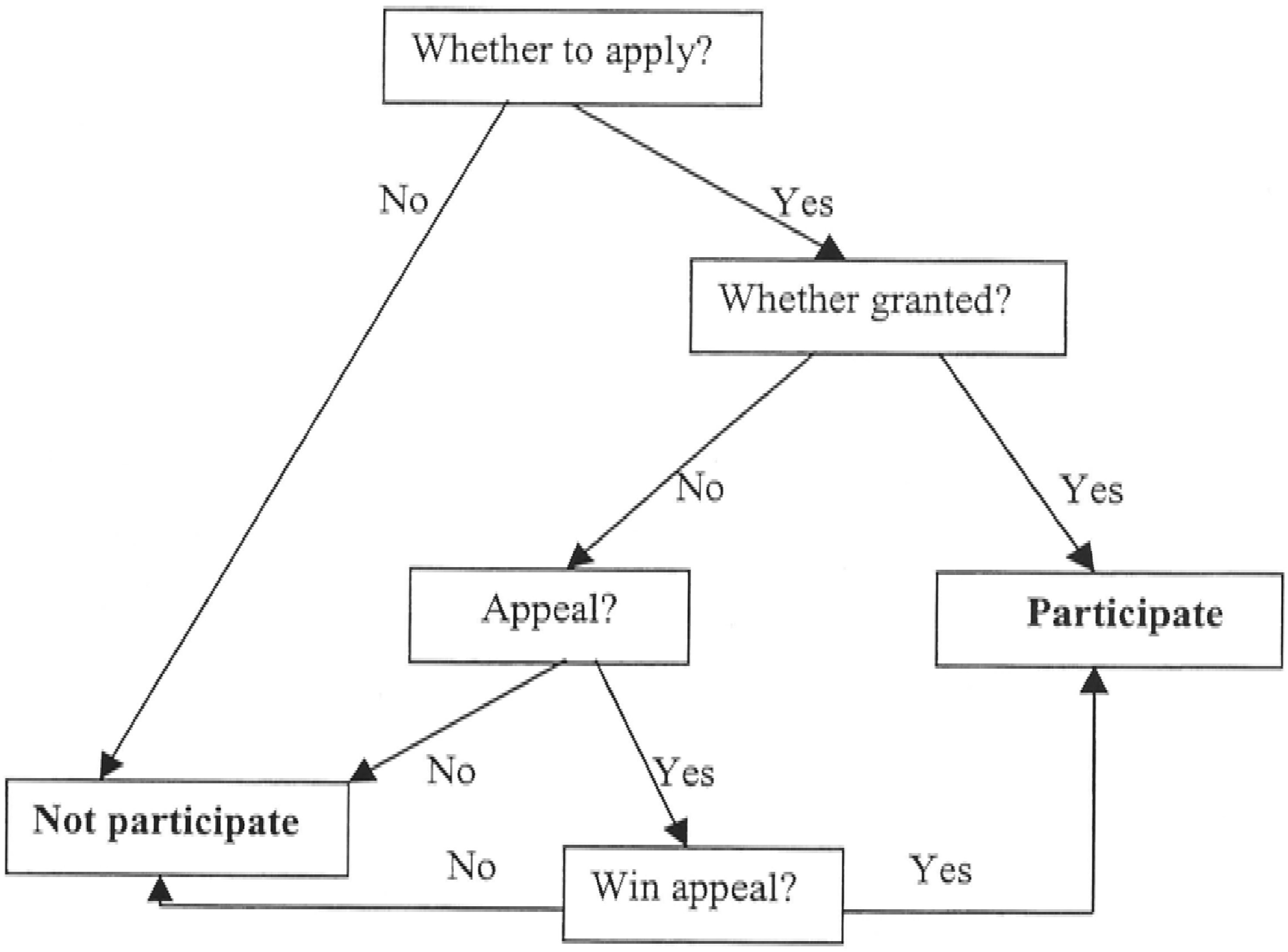
3.3. Modelling participation into the disability benefit program[1]

As noted earlier participation in the disability benefit program involves two decision processes: the application decision by the disabled individual and the grant decision

[1] The modelling methodology is similar to that provided by Aarts and de Jong (1992), but here labour market conditions are explicitly considered and incorporated into the model. In the context of the US disability benefit program, Hu, Lahiri, Vaughan and Wixon (1997) and Dwyer, Hu, Vaughan and Wixon (2001) present a structural model for the social security's disability determination process. Also see Halpern and Hausman (1986), Haveman, de Jong and Wolfe (1991), Kreider (1998, 1999) and Benitez, Buchinsky, Chan, Rust and Scheidvasser (1999) for modelling disability benefit program participation or applications in different contexts.

by the administrative authority. The participation process can be illustrated using the diagram in Figure 3.1. Few benefit grants go through the appeal process and to make things simple, in the following modelling, the appeal procedure is ignored.

Figure 3.1: Participation in the disability benefit program



If *P{application}* denotes the application probability of a disabled person for the disability benefit, and *P{grant|application}* the probability of the benefit being granted conditional upon the application, then the probability of participation in the program *P{participation}* can be written as

$$P\{participation\} = P\{application\} * P\{grant|application\} \tag{3.1}$$

Suppose, at a point of time, there are only two states over which a disabled person can make a choice: work or participation in the disability benefit program[2]. The choice of

[2] The implicit assumption here is that individuals are not working at the time of lodging their application. This assumption is reasonable because, given the nature of the benefit, it is unlikely that a

a disabled person between continued labour force participation and application for the disability benefit is based on the difference of expected utility from these two options, *EU(app)* and *EU(labour)*. For a person with a given health status, utility maximization will lead the individual to leave the labour force for DSP if *EU(app)* is greater than *EU(labour)*. Then:

$$P\{application\} = P\{EU(app) - EU(labour) > 0\} \tag{3.2}$$

Suppose utility is a function of income and leisure, the expected utility of labour force participation will be determined by the following equation,

$$EU(labour) = P_w * U(Y, V, L_w) + (1-P_w) * U(B_{unem}, V, L_{unem}) \tag{3.3}$$

Where P_w is the probability of being employed, and $(1-P_w)$ is the probability of being unemployed when choosing to stay in the labour force. Y is the income from employment and B_{unem} is the unemployment benefit. L_w and L_{unem} is the leisure associated with employment and unemployment, respectively. V is non-labour income[3],

Similarly, the expected utility of application is

$$EU(app) = P_{grant} * U(B_{dsp}, L_{dsp}, V) + (1-P_{grant}) * EU(labour) \tag{3.4}$$

Where $P_{grant} = P\{grant|application\}$ is the probability of an application being granted and $(1-P_{grant})$, the probability of it being rejected. B_{dsp} is the disability benefit and L_{dsp} is the leisure associated with participation in the disability benefit program[4].

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disabled person with a job applies for the disability benefit. It is possible for a person with a job to decide to apply for the benefit, but before applying they must quit the job first.

[3] Non-labour income may include the labour income of other family member(s) if the disabled person is living with a family.

[4] It may also be argued that Y and P_w should be smaller for the application-rejected persons than for the non-applicants. Aarts and de Jong (1992, p81) assert that the wage profiles of rejected applicants are "scarred" by the application process as the applicant becomes to be viewed as a productivity risk by prospective employers. Halpern and Hausman (1986) argue further that employers might view an

It is mainly through the probability of being employed when choosing to stay in the labour force, P_w, that labour market conditions, represented by the unemployment rate, R_{unem}, play a role in the individual decision to apply for disability benefit. Obviously, P_w is a function of R_{unem} and other individual characteristics IC, such as education, age and marriage status.

$$P_w = P_w(R_{unem}, IC) \tag{3.5}$$

Obviously, $\frac{\partial P_w}{\partial R_{unem}} \leq 0$. Then, the sign of

$$\frac{\partial EU(labour)}{\partial R_{unem}} = ((U(Y,V,L_w) - U(B_{unem},V,L_{unem})\frac{\partial P_w}{\partial R_{unem}} \tag{3.6}$$

is determined by $U(Y, V, L_w)-U(B_{unem}, V, L_{unem})$[5].

For a disabled person who chooses between work and participation in the disability benefit program, it is reasonable to assume that the utility from receiving unemployment benefit is less than that from work or disability benefit. With this assumption,

$$\frac{\partial EU(labour)}{\partial R_{unem}} \leq 0. \tag{3.7}$$

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individual's disruption in labour-force participation resulting from applying for disability benefit as a signal that the worker has only weak job attachment and that a health condition may hinder future productivity. They estimate that a rejected applicant to the Social Security Disability Insurance (SSDI) can expect a wage rate 10 percent below the wage rate he would have received had he not applied. But here, for simplicity, we assume the application rejection has no impact on the potential earnings and probability of being employed.

[5] Here Y, V, L_w, L_{unem} are assumed to be independent of the unemployment rate. To the extent that labor market conditions have an impact on the wage and hours of work, this assumption may be too strong.

That is, the expected utility of choosing not to apply for the disability benefit is lower, the higher the unemployment rate.

Differentiate (3.4) with respect to R_{unm},

$$\frac{\partial EU(app)}{\partial R_{unem}} = \frac{\partial P_{grant}}{\partial R_{unem}} U(B_{dsp}, L_{dsp}, V) + (1 - P_{grant}) \frac{\partial EU(labour)}{\partial R_{unem}} - \frac{\partial P_{grant}}{\partial R_{unem}} EU(labor)$$

$$= \frac{\partial P_{grant}}{\partial R_{unem}} \{U(B_{dsp}, L_{dsp}, V) - EU(labour)\} + (1 - P_{grant}) \frac{\partial EU(labour)}{\partial R_{unem}} \tag{3.8}$$

From the administrative authority's point of view, the sign of $\frac{\partial P_{grant}}{\partial R_{unem}}$ is not deterministic (see later). But, from the applicant's point of view, it is reasonable to assume $\frac{\partial P_{grant}}{\partial R_{unem}} = 0$. In this case, equation (3.8) reduces to

$$\frac{\partial EU(app)}{\partial R_{unem}} = (1 - P_{grant}) \frac{\partial EU(labour)}{\partial R_{unem}} \tag{3.9}$$

Combining (3.7), (3.9) and (3.2), we can infer $\frac{\partial P\{application\}}{\partial R_{unem}} \geq 0$. That is, the higher the unemployment rate the higher the probability of applying for disability benefit.

Combining the above hypotheses and specification, we arrive at the following reduced form model of disability benefit application probability:

$$P\{application\} = H(R_{unem}, Y, B_{dsp}, B_{unem}, V, L_w, L_{unem}, IC) \tag{3.10}$$

The second factor that determines participation is the conditional grant probability, $P\{grant|application\}$. Although the purpose of the disability benefit program is to provide income support for those with a specified degree of disability (*DIS*), other non-medical factors are taken into account by the administration, such as labour market conditions that reflect the employment opportunities for the disabled, and individual characteristics (*IC*) reflecting the employability of the disabled person. Hence, the conditional probability of granting can be specified as:

$$P\{grant|application\} = P_{grant}(DIS,\ R_{unem},\ IC). \tag{3.11}$$

As noted above the sign of $\frac{\partial P_{grant}}{\partial R_{unem}}$ is undetermined, depending on how the administration responds to the change in labour market conditions. For instance, $\frac{\partial P_{grant}}{\partial R_{unem}} > 0$ if the administration adopts an accommodation policy; $\frac{\partial P_{grant}}{\partial R_{unem}} < 0$ if the goal of the administration is to contain grants during recessions; and $\frac{\partial P_{grant}}{\partial R_{unem}} = 0$ if there is no response at all to the change in labour market conditions.

Combining equations (3.10) and (3.11), we derive the following reduced form model of DSP participation:

$$P\{participation\}=P\{DIS,\ R_{unem},\ Y,\ B_{dsp},\ B_{unem},\ V,\ L_{dsp},\ L_{unem},\ L_{w},\ IC) \tag{3.12}$$

It is clear from the above model development that labour market conditions affect both processes. As the sign of $\frac{\partial P_{grant}}{\partial R_{unem}}$ is not determined, the sign of $\frac{\partial P\{participation\}}{\partial R_{unem}}$ is not determined, either.

However, at the aggregate level (as opposed to individual choice), another aspect of the effect of labor market conditions should also be considered. Worsening labour market conditions may lead to a higher probability of disabled workers of being laid-off relatively to non-disabled workers. And, once being laid-off, the disabled workers may apply for disability benefit rather than stay in the labour force. If the laid-off disabled workers are at least as disabled as those already being accepted into the program, the number of participants increases at the aggregate level even if the administrative authority does not change the decision rule.

The above model development, especially through equation (3.2) and (3.4), also shows that the level of the disability benefit relative to the wage has a positive effect on disability benefit program participation and hence on program growth.

3.4. The literature[6]

The earliest studies using econometric methods to explain the growth of the disability benefit program date back to 1974 and 1975 (Lando, 1974; Hambor, 1975). These two US studies were stimulated by the sharp increase in applications and grants in the Social Security Disability Insurance (SSDI)[7] before 1975. Both studies used national aggregate time series (quarterly) data and focused on the effect of the business cycle represented by the unemployment rate. Using the quarterly data from 1962 to 1973, Lando (1974) found that a 1 percentage point increase in the unemployment rate raised the applications for SSDI by 2-4 percent depending on specifications. However, using a shorter data period from 1964 to 1971, Hambor (1975) estimated a larger impact of 7 percent. Using a slightly modified model to that utilised by Lando (1974) and quarterly data from 1964 to 1978, Lando, Coate, and Kraus (1979) confirmed the significant impact of the unemployment rate on applications.

Recent studies on the impact of the unemployment rate on the SSDI program in the US have used cross-states and time series data[8]. Stapleton, Coleman and Dietrich (1995) used the period 1988 to 1992, and estimated that a 1 percentage point increase

[6] The brief review of the literature in this section focuses on the impact of labour market conditions on the growth of the disability benefit program. For a review of other factors on the program growth, see Bound and Burkhauser (1999).

[7] There are two programs in the US providing disability benefit: Social Security Disability Insurance (SSDI) and the Supplementary Security Income (SSI). SSDI is based on earnings and only covers those employed, while SSI is not employment related but subject to a means test.

[8] The impact of the unemployment rate on SSI was also examined in these studies. The estimated effect on SSI was lower than that on SSDI. See Rupp and Stapleton (1995) for a summary of these study results.

in the unemployment rate raised applications for SSDI by 4 percent. Their estimated effect on the final grants was 3 percent. Using a longer time period from 1980 to 1993, Stapleton and Dietrich (1995) estimated that a 1 percentage point increase in the unemployment rate was associated with a 2 percent increase in the initial determinations of SSDI during the year of the unemployment rate increase, a 3 percent increase after one year and a 5 percent increase after two years. Also using data over the period 1988 to 1992, but differentiating the applications and grants by gender, Rupp and Stapleton (1995) estimates an elasticity of SSDI applications per capita with respect to the unemployment rate of 0.27 for men and 0.13 for women, and an elasticity of SSDI grants of 0.18 for men and 0.06 for women. The estimated elasticity for women was not significant.

British studies using time series data (HMSO, 1985; Creedy and Disney, 1989) also found a positive link between Invalidity Benefit (IVB) claimants and the unemployment rate over time. Disney and Webb (1991) also employed cross-sections (counties) and time series data to examine the effect of unemployment. Instead of using applications and/or grants as the dependent variables, they used the proportion of individuals in the eligible population of a particular region in receipt of IVB as the dependent variable (this is the incidence rate as defined in Chapter 2). After controlling for the replacement rate, the population over 55 years of age and regional dummies, they found a significant impact of the unemployment rate on the dependent variable[9]. They also estimated the effect of the unemployment rate on the individual probability of IVB receipt using Family Expenditure Survey data. By applying a Probit model respectively to the 1980, 1984 and 1988 data, they found that the unemployment rate significantly raised the individual probability of receiving IVB, although the estimated coefficients were different among the three years. Molho (1991) also found that the local (female) unemployment rate had a significant effect on a woman's probability of entering IVB, although this impact was not significant for men (Molho, 1989).

[9] Deviations from the regional mean over time of the variables are used in the regression, rather than the level of the variables, to avoid non-stationarity problem.

Another related study by Piachaud (1986) examined the effect of unemployment on the proportion of older males (aged 55-59, and 60-64) who stated in the Censuses of England that they were disabled (permanently sick or disabled). Piachaud first used 1981 cross-counties data and regressed the proportion of the disabled on the unemployment rate. Then, he regressed the change in the proportion of disabled from 1971 to 1981 on the change in the unemployment rate over the same period and the unemployment rate in 1971, again using county variation of these variables. In both regressions, for both age groups, Piachaud found the coefficients on the unemployment rate and the change of the unemployment rate were significant and concluded that increases in unemployment had been significantly correlated with increases in the number of older males stating they were disabled. He attributed half of the increase in disability over the period from 1971 to 1981 to a worsening labour market.

In Australia, the impact of labour market conditions on the usage of the Invalid Pension (and other income support payments) was noted by Stricker and Sheehan (1981). When examining the *hidden unemployment* problem in the 1970s in Australia, Stricker and Sheehan found that the Invalid Pension was one avenue of hidden unemployment and that worsening labour market conditions were associated with a higher usage rate of this pension. The usage rate was defined as the percentage of the number of Invalid Pension recipients to the relevant population. The number of recipients is determined not only by current inflows, but also by inflows in the past and the continuation rate of inflows (see Chapter 2). The theory discussed earlier suggests that labour market conditions have a direct impact on inflows. Therefore, the usage rate may not be a good measure to analyse the impact of labour market conditions on income support recipients. A focus on inflows and outflows may provide a better analysis.

Stricker and Sheehan's finding was based on time series data. Carter and Gregory (1981) provided supportive results using cross sectional (regions) data[10]. Specifically, they found that regions with a higher unemployment rate also had a higher usage rate of the Invalid Pension (and other income support payments, such as the sickness

[10] Carter and Gregory's (1981) study is in Appendix 1 in Stricker and Sheehan's (1981) book.

benefit) among males aged 15 and over. One problem with using the usage rate in this cross-region study is that the higher usage rate of income support payments may not be caused directly by higher unemployment. It is highly likely that regions with higher unemployment have lower living costs and are more attractive for people living on income support payments (Morrow, 2000). Once again a focus on inflows into a region and the duration of a spell in a region may provide a better analysis. This chapter uses inflows rather than the number of recipients to overcome problems just noted above.

3.5. Empirical evidence from Australian data

3.5.1. The data

Two data sets are used for the empirical analysis: the aggregate time series data and the cross-states-time-series data. The following variables are derived using the two data sets: the application rate (app_rate) defined as the number of applications per 1000 DSP age eligible population, the grant rate (grant_rate) defined as the number of grants per 1000 DSP age eligible population and the population ratio (p50_pop), defined as the ratio of the population aged 50 to the Age Pension age to the DSP age eligible population. The variable p50_pop is used to control for changes in population structure (population ageing). The ratio of the maximum single pension rate to the average weekly earnings (replacement_rate)[11] is also included to control for the impact of the financial attractiveness of DSP benefits.

The basic data are from different sources. Applications, grants, and pension rate come from a variety of publications by the social security administrative authority[12]. Other data, such as the DSP age eligible population, the average weekly earnings and the unemployment rate are taken from relevant ABS publications[13].

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[11] Here male total earnings are used because before 1981 only Average of Weekly Earnings (AWE) of a Male Unit was available.

[12] Applications and grants at state level between 1970 and 1987 come from William Nichol (1988). Applications and grants at the national level come from DSS (July 1997). The pension rate comes from the annul DSS (FaCS) reports.

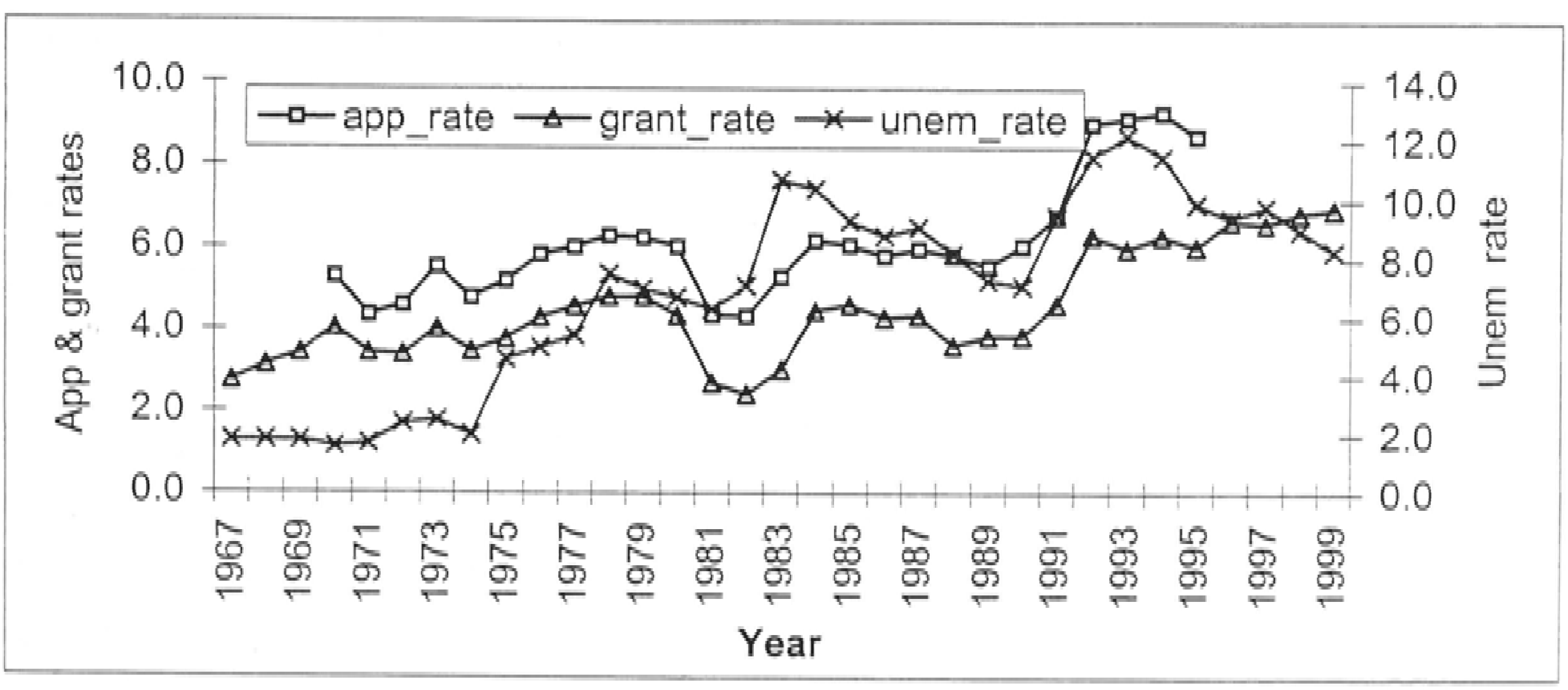
[13] Refer to sources of Figures 2.2, 2.9 and 2.10 in Chapter 2.

The time periods covered by these two data sets are different because of data availability on the number of DSP applications and grants. The cross-states-time-series data set covers 1971 to 1987. The aggregate time series data set covers a longer period. Similarly, the number of DSP applications is only available for the period 1970 to 1995, while the number of DSP grants is available from 1967 to 1999.

To get a flavor of the relationships between the application rate, the grant rate and the unemployment rate, Figure 3.2 presents these three rates using the aggregate time series data[14]. The application and the grant rates match each other very closely. Both increased steadily to the end of the 1970s, experienced a drop in the early 1980s and then increased very quickly. The application rate appeared very stable between 1984 and 1990, while the grant rate showed a slight decline. Between 1991 and 1992 both increased sharply.

The close association between the application and grant rates might suggest one of two things. Either most of the incremental applications over the period met the unchanged eligibility criteria, if the decision rule did not change in response to an increase in the applications; or, if the incremental applicants possessed a different level of disability, the decision rules must have varied in response to applications.

Figure 3.2: The application, grant and unemployment rates



[14] The relationship between the unemployment rate and the grant rate was presented before in Figure 2.8 in Chapter 2.

Another striking point derived from Figure 3.2 is the variation of the application rate at the time when policy (or eligibility criteria) changes took place. The coincidence of application variation and policy changes suggests that the applications of those with disability responded to the tightness of screening and the relaxation of the eligibility criteria. As noted earlier, the policy change in 1980 did not alter the legislative eligibility criteria and only tightened the implementation of the rules. It is interesting to note that a change in implementation not only reduced the grant rate but also decreased the application rate, suggesting a close relationship between applications and screening stringency[15]. It is not clear why this occurs. One explanation may be that the potential applicants are fully aware of the eligibility requirements, form their own probabilities of being successful if they apply and then adjust their application decision. Another possibility however, is that potential applicants may not have enough information about the eligibility requirements for DSP. But, as they apply for other income support payments, such as unemployment benefit, government officials may suggest they apply for DSP if eligible. Since government officials normally know the eligibility criteria better than applicants, the applications may then vary with the change in the eligibility criteria. Given that most people are unlikely to be fully aware of the income support system, this seems the more likely explanation for the relationship between applications and screening stringency.

The relationship between the change in the application rate (and the grant rate), the change in the unemployment rate and policy changes is the focus of this chapter. The increase in the unemployment rate during the 1970s was clearly associated with the increase in the application and grant rates. The increases in the unemployment rate

[15] This is also noted from the US experience. Over the 1976-1978 period, the application rate fell more steeply in states that had tightened their screening (Bound and Burkhauser, 1999). Using the variations in the screening stringency among states, Parson (1991a) estimated an elasticity of applications with respect to the screening stringency instrumented by the initial award rate to be 0.45. Stapleton, Kevin, Coleman, Dietrich and Livermore (1998) re-estimated Parsons's equation, including demographic and business cycle controls, and found that doing so reduced the magnitude of the estimated coefficient by 50 percent. However, Bound and Burkhauser (1999) believe that these elasticities underestimate the long-run effect of the eligibility standard on the application rate.

between 1981 and 1983 and between 1990 and 1992 were also followed by increases in the application and grant rates, but, as noted earlier, policy changes also occurred during these two periods. However, the decrease in the unemployment rate since 1993 was not associated with a decrease in the grant rate. This may be because population ageing had started to have an impact, as shown in Figure 2.11 in Chapter 2.

As for the cross-states-time-series data[16], Table 3.1 presents the state mean values of all the variables over the period 1971 to 1987[17]. Even from these mean values, some association appears between the application rate and the unemployment rate. The two states with the highest mean application rate (SA and QLD) also have the highest unemployment rate, while the state with the lowest application rate (VIC) has the lowest unemployment rate. For the grant rate and the unemployment rate the association is not so close. While the state with the lowest grant rate has the highest unemployment rate, the state with the highest grant rate is not the state with the highest unemployment rate.

The changes in population age structure are often assumed to significantly influence the growth of the DSP program, but in Table 3.1, the application and grant rates have no clear relationship with the ratio of population aged 50 to the Age Pension age to the DSP age eligible population (p50_pop).

Table 3.1: Means and standard deviations of cross-states-time-series data, 1971 to 1987

		NSW	VIC	QLD	WA	SA	TAS
app_rate	Mean	5.57	5.38	5.63	5.52	6.01	5.52
	Std.Dev.	*1.02*	*0.89*	*0.96*	*0.96*	*0.85*	*0.56*
grant_rate	Mean	3.98	3.92	3.96	4.09	4.30	4.07
	Std.Dev.	*1.08*	*0.89*	*0.97*	*0.83*	*0.67*	*0.53*
unem_rate	Mean	6.75	5.60	7.01	6.45	6.99	6.81
	Std.Dev.	*3.63*	*2.51*	*3.18*	*2.84*	*3.50*	*3.10*
p50_pop	Mean	19.49	19.23	18.90	17.09	19.21	19.33
	Std.Dev.	*0.59*	*0.55*	*1.05*	*0.35*	*0.69*	*0.81*
replace_rate	Mean	21.39	23.04	22.78	21.86	23.79	24.17
	Std.Dev.	*1.80*	*1.79*	*1.87*	*1.60*	*1.70*	*1.81*

[16] Data for NSW and ACT, and SA and NT are combined because before 1976 the unemployment rate data for each state are not available. The rates reported here are calculated using the registered unemployed persons taken from *Employment and Unemployment, ABS 6213.0.* The registered unemployed persons are not separable between NSW and ACT and SA and NT.

3.5.2. Model specification

Disney and Webb (1991) noted, for the British studies using time series only data, that the time series data were heavily time-trended and Augmented Dickey Fuller (ADF) test for the presence of co-integration was rejected. Early US time series studies did not provide test statistics on variable stationarity. From Chart 1 in Lando, Coate and Kraus (1979), it appears likely that the dependent variable is non-stationary. Using cross-sectional and time series data cannot get around the non-stationarity problem. But, if the time period is short, and the variation of the cross sectional observations is large, as in the Stapleton, Coleman and Dietrich's (1995) studies, the non-stationarity problem may not be as serious as in the pure time series analysis.

The Australian time series are non-stationary. The ADF test shows that, except for the variable p50_pop, all variables are integrated of order one, i.e. I(1) (see Table 3.A1 in Appendix 3B). However, as shown in Table 3.A2 in Appendix 3B, the residuals from the model estimation (to be discussed shortly) are stationary, implying that there exist cointegration relationships between the I(1) dependent variables and the I(1) explanatory variables, and non-stationarity may not be a problem. However, to test the robustness of the relationships between the application and grant rates and the unemployment rate, regression results using the first differences of the variables are also reported.

The basic model is as follows

$$\begin{aligned} y_t &= \alpha + \beta_1 unem\_rate_t + \beta_2 unem\_rate_{t-1} \\ &\quad + \delta p50\_pop_t + \gamma replace\_rate_t + \pi time\_tr \\ &\quad + \varphi_1 year\_80 + \varphi_2 year\_87 + \varphi_3 year\_91 + \mu_t \end{aligned} \tag{3.13}$$

where y_t is either the application rate (app_rate) or the grant rate (grant_rate). Note that not only the current unemployment rate, but also the one year lagged unemployment rate is included as a regressor to capture the dynamic impact of the unemployment rate. A time trend variable (time_tr) is also included. Year dummies

[17] Appendix 3A presents figures illustrating all the relevant variables by state.

are included to reflect the policy changes as discussed earlier. For the cross-states-time-series data, only one year dummy, year_80, is included because the data ended in 1987.

μ_t is the disturbance term. For the aggregate time series only data, the disturbance assumptions follow the standard linear regression model specifications. But for the cross-states-time-series data, the assumptions on μ_t are that the variances are different across states and, although there is no autocorrelation within a state (as in the aggregate time series only case), there are cross-state correlations[18]. In the cross-states-time-series model,

$$\mathrm{var}(\mu_{it}) \neq \mathrm{var}(\mu_{jt}) \text{ for } i \neq j;$$
$$\mathrm{cov}(\mu_{it}, \mu_{i,t-1}) = 0; \text{ and}$$
$$\mathrm{cov}(\mu_{it}, \mu_{jt}) \neq 0 \text{ for } i \neq j. \qquad (3.14)$$

3.5.3. Estimation results

The application rate equation

Table 3.2 presents the time series only and cross-states-time-series results for the application rate equation. Both data sets produce a significant impact of the unemployment rate on the application rate. This is also confirmed by the regressions using the first difference forms of the variables. However, it is the one-year-lagged unemployment rate that matters rather than the current year unemployment rate. This may lend support to the speculation that the disabled might search around for a job for a while before turning to the disability benefit (see Chapter 4).

[18] These specifications are based on the test of the residuals from a pooled regression. Means of the residuals by state, and the correlation coefficients across states, are reported in Table 3.A3 and 3.A4 in Appendix 3B. DSP is a federal income support program; any change impacting on this program will exert the same impact across states. This may justify the cross-state correlation assumption. Other specifications on the error term are also tried. However, the reported specifications produce the highest log likelihood.

Table 3.2: Estimation results of the application rate equation

	Aggregate time series only		Cross-states-time-series	
	Variable in level	In 1st difference	Variable in level	In 1st difference
unem_rate	0.0853	0.1943**	0.0149	0.1037**
	(0.1109)	(0.0747)	(0.0549)	(0.0456)
lag unem_rate	0.3202**	0.1800**	0.2105***	0.1812***
	(0.1135)	(0.0755)	(0.0568)	(0.0459)
p50_pop	0.0922	- 0.0123	0.1450***	0.9488***
	(0.3925)	(0.5286)	(0.0357)	(0.3703)
replacement rate	0.0275	0.0687	- 0.0183	- 0.1191
	(0.1131)	(0.1107)	(0.0327)	(0.0776)
time trend	- 0.0674		0.0581	
	(0.1036)		(0.0465)	
year_80	- 1.2855**	- 1.5179***	- 1.2682***	- 1.5889***
	(0.5473)	(0.4325)	(0.3366)	(0.3931)
year_87	0.8551	- 0.0205		
	(0.6296)	(0.4411)		
year_91	2.0849***	1.4500***		
	(0.5099)	(0.4711)		
constant	2.2391	- 0.0139	1.7503**	0.2292*
	(7.3040)	(0.1049)	(0.7715)	(0.1223)
Summary statistics of model specification				
No. of obs.	26	25	102	96
F(,)	24.86	8.72		
Prob>F	0.0000	0.0001		
R - square	0.92	0.78		
Adj-R-square	0.88	0.69		
D-W test	2.98**	2.00		
Log likelihood			- 65.3510	- 53.23
Wald chi2 (6)			60.68	56.85
Prob>chi2			0.0000	0.0000

Note: 1. Standard errors are in parentheses.

2: *** Significant at 1%; ** at 5%; * at 10%.

The coefficients of the unemployment rate in the regression, using variable levels, imply that a one percentage point increase in the unemployment rate will raise the application rate by 22.5 percent (cross-states-time-series results) to 40.6 percent (aggregate time series only results) over two years. Using the averages of the application and unemployment rates over the period between 1970 and 1995, this implies an elasticity of 0.15 to 0.29, which is similar to the estimated elasticity found by Rupp and Stapleton (1995).

The control variable, replacement rate, is not significant in any regression. While the variable, p50_pop, is not significant in the aggregate time series only data regression, it is significant in the cross-states-time-series data regression and the sign is also as expected – population aging raises the application rate for the disability benefit. This may be because the cross-states-time-series data produce more variation in this variable, which makes its impact identifiable.

The significance of the coefficient of year_80 implies that the change in the administration's rules in 1980 did have a significant negative effect on applications, even though the legislative eligibility criteria did not change. This suggests that tightening the qualification requirements for DSP may not need legislative changes in the eligibility criteria. Tightening the administration's rules will work in terms of reducing DSP applications. As discussed earlier, the explanation may be that individuals do have their own subjective conceptions of the probability of being granted the benefit when they make application decisions, and then the tightened decision rule discourages applications; or that potential applicants seek advice from the government agencies before making applications. The advice reflects the varying implementation rules.

Change in the legislative eligibility criteria in 1987 put more emphasis on medical requirements and was to tighten the eligibility criteria. This tightening occurred at the time when the unemployment rate was falling. In the regression when the impact of the unemployment rate is controlled the impact of the 1987 policy change become insignificant. As discussed in Chapter 2, the reason for the insignificance of the 1987 policy change may be that the eligibility criteria might have been tightened in practice before 1987.

The aggregate time series only results also show that the policy change in 1991 had a significant positive impact on the application rate. This confirms the suggestion in Chapter 2 that the 1991 policy change implied a relaxation of the eligibility criteria for DSP. Also note that the magnitude of the coefficient of the 1991-year dummy is very big compared with that of the unemployment rate.

The grant rate equation

Table 3.3 presents the results for the grant rate equation. It appears that an increase in the unemployment rate will significantly raise the grant rate, at least for the following year. The magnitude of the coefficients on the level regression implies that a one percentage increase in the unemployment rate would raise the grant rate by 15 to 23 percent. Comparing the coefficients on the unemployment rate in Table 3.3 with those in Table 3.2, it appears the (total) impact of the unemployment rate on the grant rate is smaller than its impact on the application rate[19]. This may suggest that the incremental applicants as a consequence of a recession might not on average have a disability as serious as those who would apply irrespective labour market conditions.

Again the replacement rate is not significant in all regressions. While the variable, p50_pop, is significant in the level regression using cross-states-time-series data, implying population ageing significantly raises the grant rate as expected, but this is not confirmed in other regressions.

As in the application rate equation, the change in the eligibility criteria in 1980 and 1991 significantly reduced and increased the grant rate respectively. In the first difference regression, using the time series only data, the 1987 year dummy produces a negative, weak significant coefficient, but it is not confirmed in the level regression.

[19] Note that the time series only data regression of the grant rate equation in Table 3.3 covers a longer period than the regression of the application rate equation in Table 3.2. The regression results of the grant rate equation using the same period as the application rate equation are different in terms of the magnitude of the coefficients on variables of interest, but not in terms of statistical significance. Also the difference between the coefficients on the variable of interest is smaller in the first difference regression than in the level regression. See Table 3.5A in Appendix 3B.

Table 3.3: Estimation results of the grant rate equation

	Aggregate time series only		Cross-states-time-series	
	Variable in level	In 1st difference	Variable in level	In 1st difference
unem_rate	0.0069	0.0628	-0.0336	0.1195**
	(0.1002)	(0.0744)	(0.0456)	(0.0418)
lag unem_rate	0.2241**	0.1540**	0.1791***	0.1682***
	(0.0852)	(0.0714)	(0.0468)	(0.0424)
p50_pop	0.2314	0.1066	0.0885***	0.3477
	(0.1780)	(0.3175)	(0.0319)	(0.3236)
replacement rate	- 0.0710	0.0515	- 0.0024	- 0.0671
	(0.0835)	(0.0976)	(0.0293)	(0.0629)
time trend	0.0993**		0.0823**	
	(0.0446)		(0.0378)	
year_80	- 1.9511***	- 1.6860***	- 1.3770***	- 1.2409***
	(0.4369)	(0.4430)	(0.2563)	(0.2879)
year_87	0.0240	- 0.8096*		
	(0.4927)	(0.4507)		
year_91	1.1373***	1.0572**		
	(0.3868)	(0.4815)		
constant	- 0.7547	0.1197	1.2913**	0.0733
	(3.7620)	(0.0833)	(0.6053)	0.1025
Summary statistics of model specification				
No. of obs.	33	32	102	96
F(,)	28.83	6.30		
Prob>F	0.0000	0.0009		
R - square	0.9057	0.6294		
Adj-R-square	0.8743	0.5213		
D-W test	2.2720**	2.1587**		
Log likelihood			- 55.2015	- 45.7160
Wald chi2 (6)			64.18	56.67
Prob>chi2			0.0000	0.0000

Note: 1. Standard errors are in parentheses.

2: *** Significant at 1%; ** at 5%; * at 10%.

Comparing the estimates for the year dummies in the application and grant rate equations in the level regressions, for the 1980 year dummy, the coefficient in the grant rate equation is always less than that in the application rate equation. Although the tightened eligibility criteria in 1980 deterred applications as noted earlier, it was more effective in reducing grants, which was the purpose of tightening the administrative rule at that time.

The policy change in 1991 had a bigger impact on the application rate than on the grant rate. This may reflect the inconsistency of the meaning literally conveyed by the changed eligibility criteria and the intention of this policy change. One of the objectives of the introduction of the Disability Reform Package (DRP) in 1991 was to contain the rapid growth of the DSP program (DSS, 1992). However, as discussed in Chapter 2, the new eligibility criteria might well be a relaxation of the eligibility requirements. On the one hand, the relaxed eligibility criteria attracted more applicants; on the other hand, with the intention of reducing the number of DSP recipients, the administrative authority might have to implement the changed rules more restrictively. These then resulted in a larger impact on applications and a smaller impact on grants.

Selected model specification test statistics are also reported in Tables 3.2 and 3.3[20]. The F-statistics for the time series only model and the Wald chi2-statistics for the cross-states-time-series model test the hypothesis that all the explanatory variables (except for the constant) have zero coefficients. Clearly, this hypothesis is rejected at any significant level for both equations. Coefficients of determination are also reported for the time series only results. As the statistics show, the explanatory power of the models is quite high. Durbin-Watson (D-W) test statistics are also provided for the time series only models. In level regression, for both the application rate and the grant rate equations, the hypothesis that there is no autocorrelation is not rejected at the 5 percent significant level. In the first difference regression, autocorrelation is rejected at the 5 percent level for the grant rate equation, but the D-W test statistics fall in the uncertain region for the application rate equation.

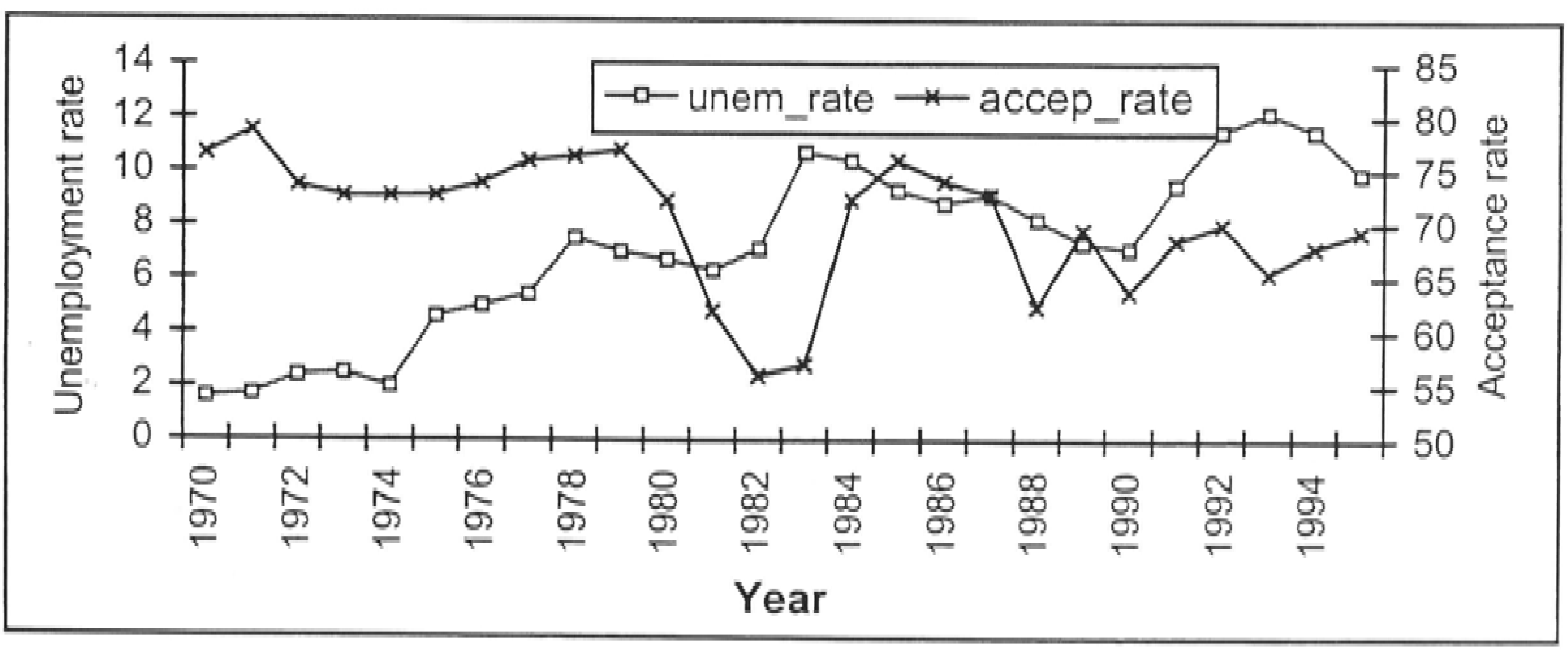
[20] The test statistics for heteroscedasticity in the time series only regressions are not reported, but in both equations heteroscedasticity is rejected.

3.6. The response of the administrative authority to labour market conditions

It was noted earlier that it is not possible to predict *a priori* the response of the administrative authority to labour market conditions. The actual response is an empirical question. This section briefly examines this issue. To do this we must measure the restrictiveness of the administrative authority in implementing the eligibility criteria. Given the available data, one measure might be the application acceptance rate (accept_rate) defined as the number of grants per 100 applications for DSP[21]. The basic assumption when using the accept_rate as the measure of the policy administration is that, if the legislative eligibility criteria remain unchanged and the health conditions of the population do not worsen over time, any variation in the accept_rate should only reflect the change of the restrictiveness in implementing the eligibility criteria.

Figure 3.3 plots the acceptance and unemployment rates over the period 1970 to 1995[22]. There is no obvious close association between these two rates.

Figure 3.3: DSP acceptance rate and the unemployment rate, 1970 to 1995



[21] Essentially, the acceptance rate equals the grant rate divided by the application rate multiplied by 100.

[22] Numbers of applications after 1995 are not available.

To assess the impact of the unemployment rate on the acceptance rate, a model similar to that specified in equation (3.13) is employed. But here the dependent variable is the acceptance rate. The independent variables include, the current and one year lagged unemployment rates, the population ratio (p50_pop) and year dummies to reflect policy changes. The replacement rate variable is excluded, as there is no reason to believe that the value of the benefit has any impact on the restrictiveness of implementing the eligibility rule.

The estimated results are reported in Table 3.4, including both the level regression and the first difference regression[23].

Looking at the level regression only, the results show that an increase in the current year unemployment rate tends to reduce the acceptance rate in the current year but increases it in the next year. The total impact, accounting for both years, is to increase the acceptance rate. The current year decrease in the acceptance rate may occur because of the lag between applications and grant decisions; or, it could be that the incremental applicants in response to the increase in the unemployment rate are less eligible for the benefit. Similarly, the second year increase in the acceptance rate may also be a result of the lag between applications and grant decisions; or it could arise because the administrative authority relaxes the decision rule to accommodate the increase in applications.

The results from the first difference regression also confirm the positive total impact of the unemployment rate on the acceptance rate, although the significance of the time series only regression is weak.

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[23] As shown in Table 3.A1 in Appendix 3B, the acceptance rate is also in I(1). But as in the application and grant rate equations, the residuals from the level regression are also stationary (see Table 3.A2 in Appendix 3B). Again the model is applied to both the time series only and the cross-states-time-series data and the assumptions on the disturbance terms are the same as in the application and the grant rate equations.

Table 3.4: Estimation results of the acceptance rate equation

	Aggregate time series only		Cross-states-time-series	
	Variable in level^	In 1st difference	Variable in level	In 1st difference
unem_rate	- 1.4152*	- 0.5439	- 0.6057**	0.5978*
	(0.7675)	(0.7794)	(0.2801)	(0.3383)
lag unem_rate	1.9703***	1.7084*	1.3021***	1.2412***
	(0.6737)	(0.8252)	(0.2929)	(0.3384)
p50_pop	- 5.7381	- 3.3672	- 0.6235*	- 5.2196**
	(3.6391)	(5.7746)	(0.3195)	(2.5627)
year_80	- 15.8941**	- 10.3413**	- 7.9788***	- 3.7531*
	(5.8343)	(4.7725)	(1.2389)	(2.1910)
year_87	- 7.8271	- 12.0778**		
	(5.3281)	(4.8786)		
year_91	2.5616	- 1.3089		
	(4.2163)	(5.1567)		
constant	185.99	- 0.0081	83.7089***	- 1.4560**
	(71.1359)	1.0933	6.2918	(0.6923)
Summary statistics of model specification				
No. of obs.	26	25	102	96
F(,)	5.20	2.51		
Prob>F	0.0026	0.0603		
R - square		0.4560		
Adj-R-square	0.5986	0.2747		
D-W test	2.1769**	2.2178**		
Log liklihood			- 281.02	- 284.13
Wald chi2 (6)			52.22	25.14
Prob>chi2			0.0000	0.0000

Note: 1. Standard errors are in parentheses.

2: *** Significant at 1%; ** at 5%; * at 10%.

3. ^ Standard errors in the level time series only data regression are estimated with robust regression to account for heteroscedasticity.

The results from the cross-states-time-series data indicate that population ageing tends to reduce the acceptance rate, but this is not confirmed by the time series only data results. The tightening of the decision rule in 1980 was strongly supported by the estimation results as all regressions produce significantly negative coefficients. Interestingly, while the change in the eligibility criteria in 1991 can be regarded as a relaxation in terms of increasing applications and grants of DSP benefit, it does not represent a relaxation in the decision rule implemented by the administrative authority, because the 1991 year dummy is not significant and the level regression and the first difference regression produce an opposite sign.

3.7. Simulations of the impacts of the unemployment rate and policy changes

This section simulates the impact of the unemployment rate and policy changes on grants and on the number of DSP recipients. The simulation results for the application rate and the number of applications are presented in Appendix 3D. The focus here is on the simulated grant results because from the simulated grant rate it is possible to estimate the subsequent impact on the number of recipients. Specifically, this section estimates what the grant rate and the number of DSP recipients would be between 1971 and 1999 if the unemployment rate were kept at the 1970 and 1971 levels and what the grant rate and the number of recipients would be if there were no policy change in 1991. The impact of the policy change in 1991 is simulated because this change had led to a dramatic increase in the grant rate. The simulation results, assuming the unemployment rate is fixed at 1970 and 1971 levels and there is no policy change in 1991, are presented in Appendix 3C

The approach here is very simple. Note that the inflow rate defined in Chapter 2 approximately equals the grant rate defined in this chapter divided by 10[24]. Using the

[24] The inflow rate defined in Chapter 2 – the ratio of inflows in a financial year to the DSP age eligible population at the beginning of the financial year. The grant rate in this chapter is defined as the number of grants (equal to inflows) per 1000 DSP age eligible population. There is a difference in the denominator. For the inflow rate defined in Chapter 2 the denominator is the population at the

model in the first column in Table 3.3 and the actual values of the other variables, the hypothetical grant rate can be estimated if the unemployment rate is fixed at the values in 1970 and 1971 or if there was no policy change in 1991. Once the simulated grant rate is obtained, an estimation of the hypothetical number of recipients can be calculated as is done in Chapter 2.

3.7.1. Simulated impact of the unemployment rate over the period 1971 to 1999

First, Figure 3.4 presents the actual grant rate, the predicted grant rate from the model, and the hypothetical grant rate by fixing the unemployment rate at 1970 and 1971 levels (1.6 and 1.7 percent, respectively). Comparing the actual and the predicted grant rates indicates that the model fits the data quite well. The difference of the model predicted grant rate and the calculated hypothetical rate could be attributed solely to the impact of the unemployment rate, which is shown by the bottom line in Figure 3.4. From 1970 to 1999 the predicted grant rate increased by 3.41, from 3.45 to 6.86; the hypothetical grant rate increased by 1.76, from 3.40 to 5.16. Thus, about one half (1.65) of the increase in the predicted grant rate can be attributed to the impact of the unemployment rate, and another one half (1.76) to other factors.

From Figure 3.2, there were three periods when the unemployment rate showed dramatic increase, 1974-1978, 1981-1983 and 1990-1993. As a result, over the periods 1975-79, 1982-1984 and 1991-1994 (note that the unemployment rate has a one year lagged impact on the grant rate), the impacts of the unemployment rate on the grant rate increased as shown by the bottom line in Figure 3.4.

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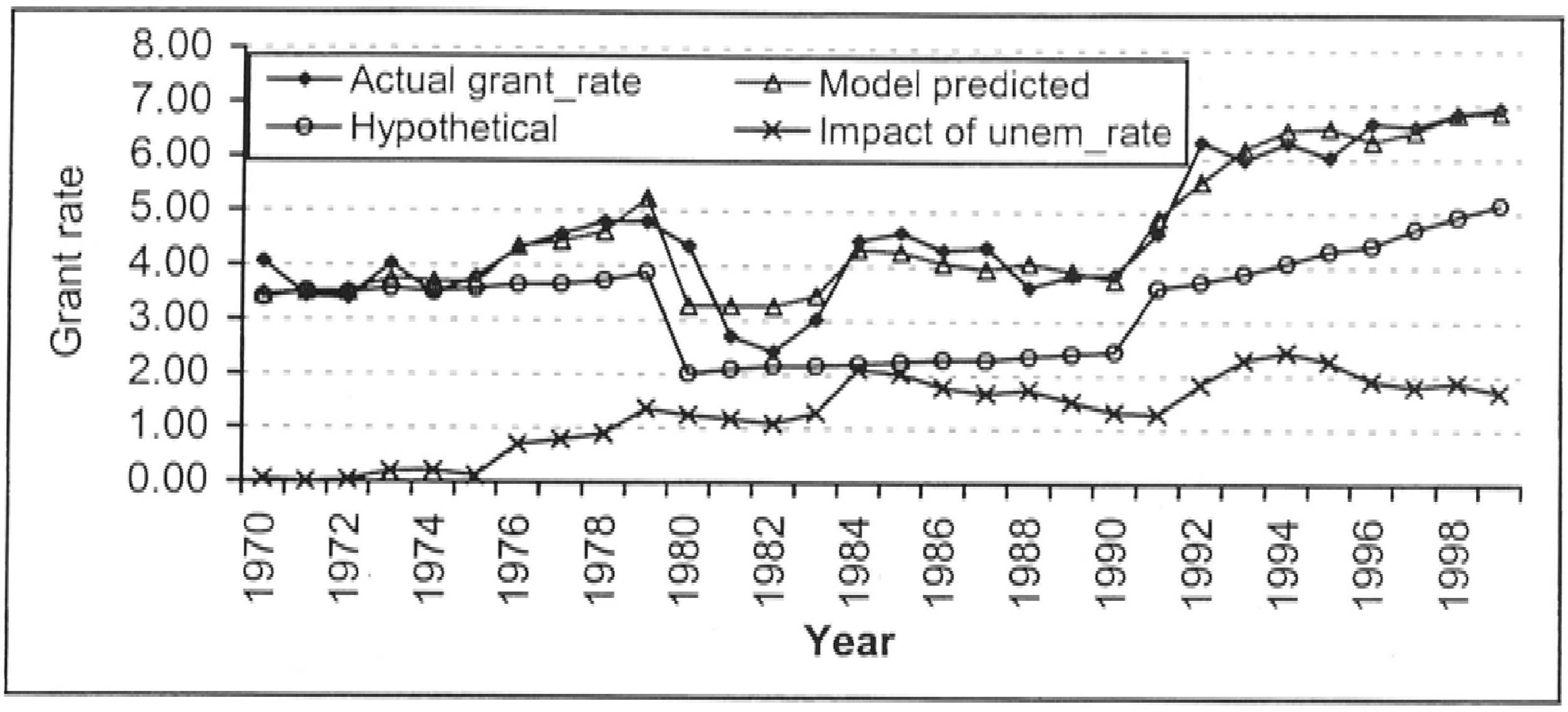
beginning of the year, while for the grant rate defined in this chapter the denominator is the population of current year.

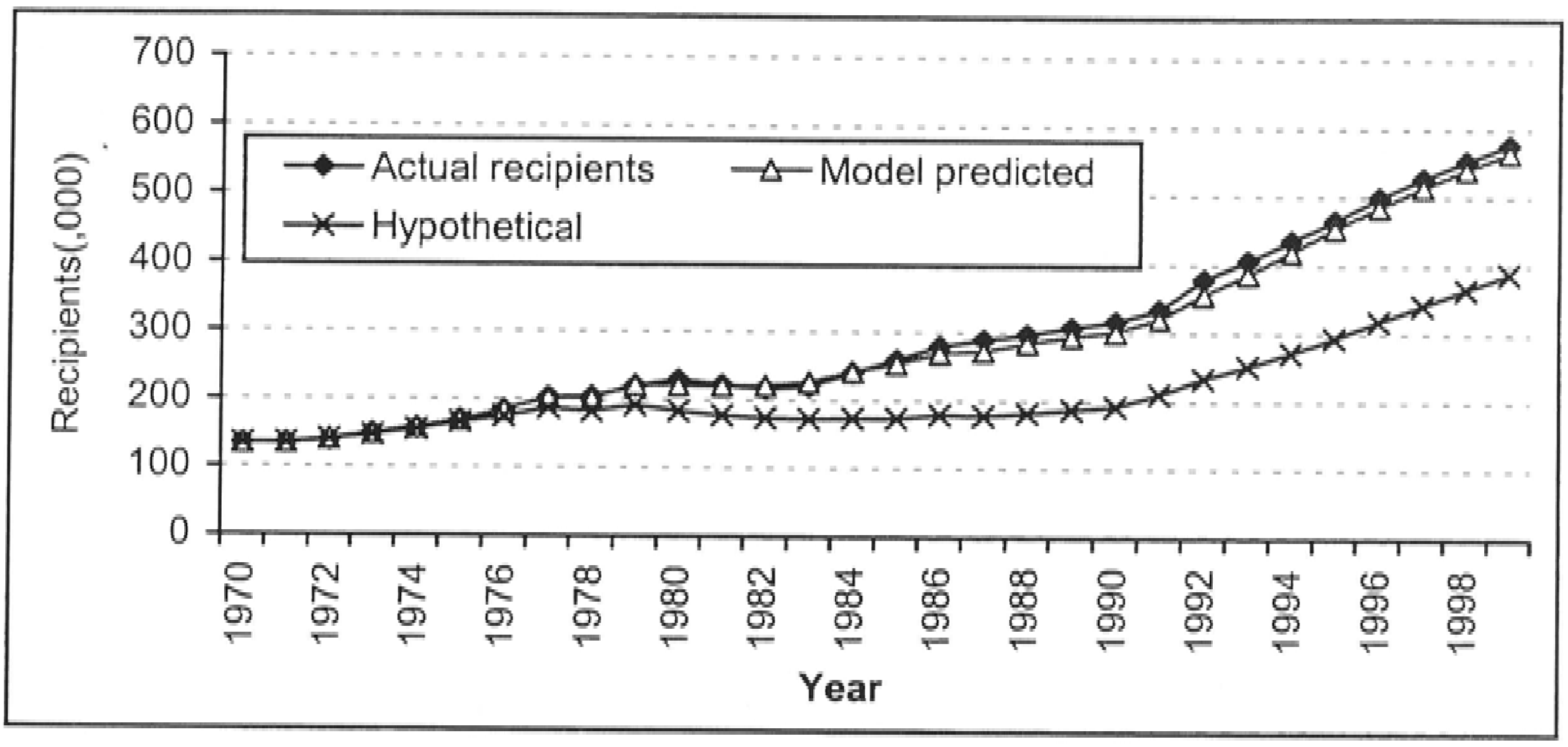
Figure 3.4: Actual, model predicted and hypothetical grant rate by fixing the unemployment rate at 1970 and 1971 levels, 1971 to 1999



To assess the subsequent effect of the grant rate on the number of DSP recipients, Figure 3.5 presents the actual, model predicted and the hypothetical numbers of DSP recipients. When calculating these projections, the actual outflow rate in each financial year as presented in Figure 2.5 in Chapter 2 is used. The difference between the model predicted and the hypothetical numbers of recipients reflects the impact of the unemployment rate. But note that the difference in each year reflects the accumulated effect of the impact of the unemployment rate on previous years' DSP inflows, since, as noted earlier, the impact of inflows on the number of DSP recipients takes long time to complete. This explains why the difference between the model predicted and the hypothetical numbers of DSP recipients is not big over the period 1974 to 1979 when the impact of the unemployment rate on the grant rate was very large.

The total impact of the unemployment rate over the period 1970 to 1999 can be assessed by comparing the increases in the number of DSP recipients over this period between the model predicted and the hypothetical recipients. From 1970 to 1999, the model predicted number of recipients (with the unemployment rate change) increases by 431,000, while the hypothetical number of recipients (without the unemployment rate change) increases by 254,000. The difference 177,200 can be attributed to the change in the unemployment rate, and it is about 30 percent of the number of recipients in 1999 and 40 percent of the increase in the actual number of recipients from 1970 to 1999.

Figure 3.5: Actual, model predicted and hypothetical number of recipients by fixing the unemployment rate at 1970 and 1971 levels, 1971 to 1999



Note that the growth rate of the hypothetical grant rate was faster in the 1990s than before. This may be because the population ratio variable (p50_pop) increased faster from early 1990s (see Figure 2.11 in Chapter 2) and as shown in Table 3.3 the magnitude of the coefficient on this variable is very big with a positive sign. The higher hypothetical grant rate and its faster increase from 1991 make the growth rate of the hypothetical number of recipients even faster as shown in Figure 3.5.

3.7.2. Simulated impact of the 1991 policy change

It is useful to simulate the impact of the 1991 policy change because, as noted earlier, it is one important factor which significantly increased the inflow rate and then contributed to the increase in the number of DSP recipients. The same approach as above is adopted to assess this impact. First, Figure 3.6 presents the actual, model predicted grant rates and the hypothetical grant rate. Over the period 1991 to 1999 the difference between the model predicted and the hypothetical grant rates is 1.137, which is the coefficient of the 1991 year dummy variable in the grant rate equation using time series level data (see Table 3.3).

Figure 3.6: Actual, model predicted and hypothetical grant rates without 1991 policy change, 1991 to 1999

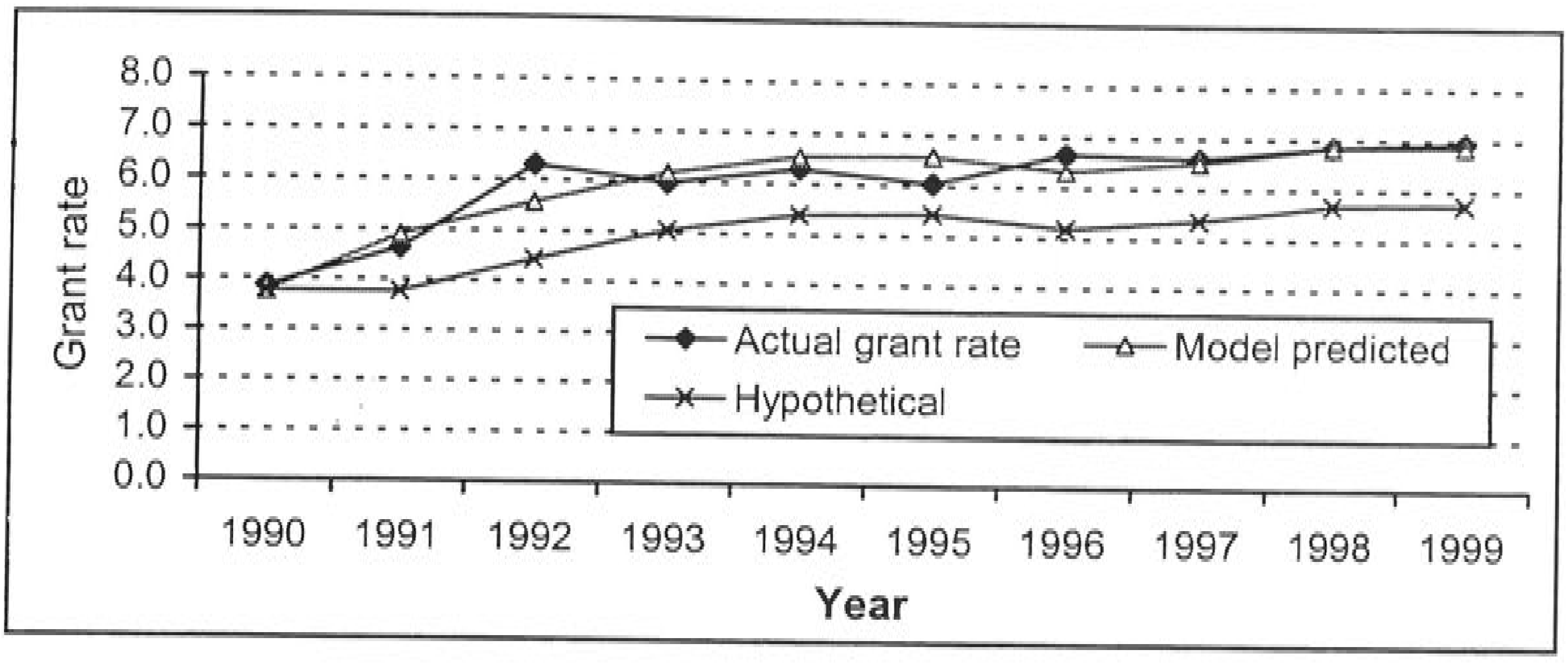
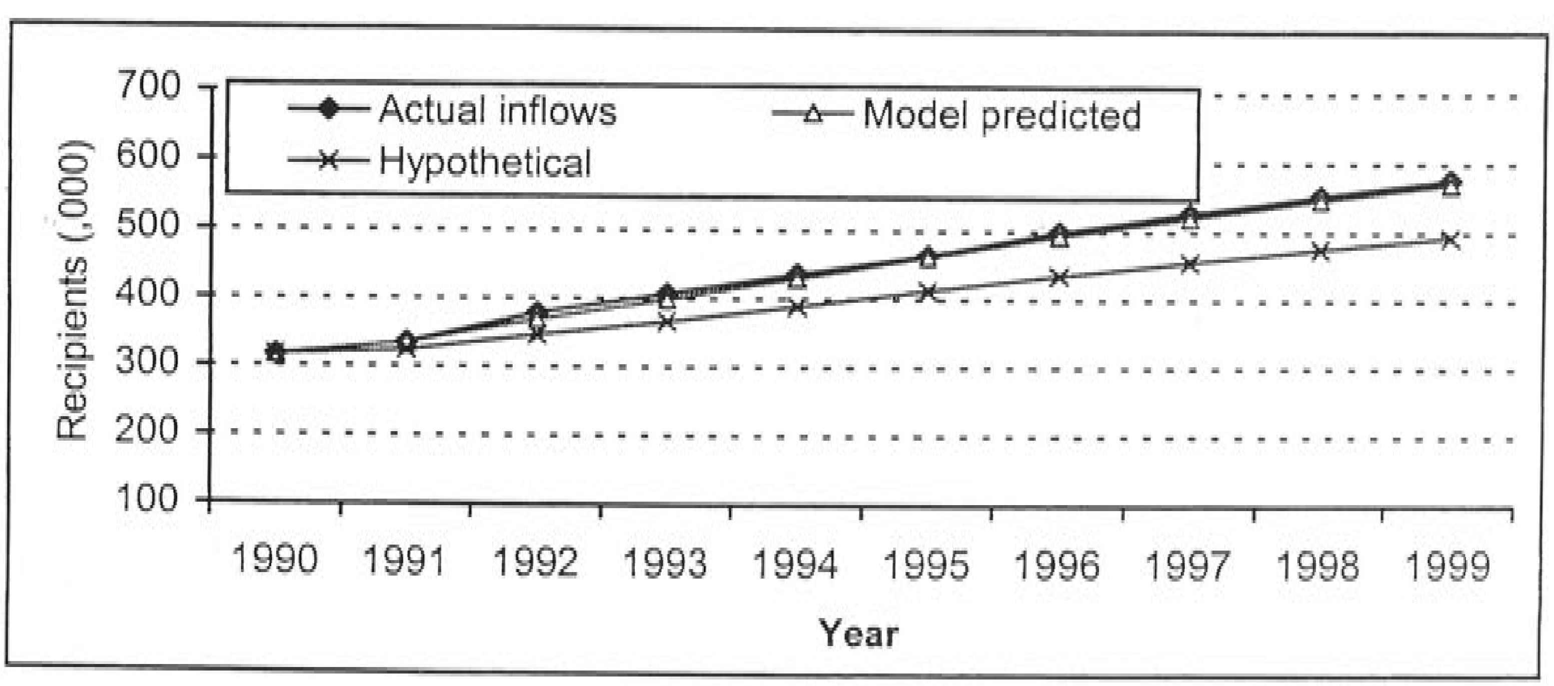


Figure 3.7 presents the actual, model predicted and hypothetical numbers of DSP recipients. From 1990 to 1999, the model predicted increase of the number of recipients is 254,600, while the increase in the hypothetical number of recipients without the 1991 policy change is 173,900. The difference is 80,700, which is the impact of the 1991 policy change on the number of recipients over the period 1991 to 1999. This is about 31 percent of the actual increase over the same period and 14 percent of the number of recipients in 1999.

Figure 3.7: Actual, model predicted and hypothetical numbers of recipients without 1991 policy change, 1991 to 1999



As noted earlier, the growth in the number of DSP recipients can be divided into three periods and the two significant policy changes (in 1980 and 1991) corresponded to these periods. Therefore, it is worthwhile to do the same exercise as above for the earlier two periods. Table 3.5 summarises the results. The results for the 1990 to 1999 period are also presented in Table 3.5 for comparison convenience.

Table 3.5: Changes in the number of DSP recipients attributed to policy and the unemployment rate impacts by period

	Change in DSP recipients (,1000)					
	1970 to 1979		1979 to 1990		1990 to 1999	
	No of recip-ients	As % of actual change	No of recip-ients	As % of actual change	No of recip-ients	As % of actual change
Policy impact			-126.78		80.72	30.96
Unemployment impact	29.63	34.50	13.83	14.25	43.77	16.79
Actual	85.88		97.06		260.75	

Note: (1).1987 policy change is ignored because its impact is not significant as shown earlier.
(2). Impact of 1980 policy change is accounted for in the 1979-1990 period.
(3). For period 1970-79, the unemployment rate is fixed at 1970 and 1971; for 1979-1990, fixed at 1978 and 1979; for 1990-99, fixed at 1989 and 1990.

In all three periods, the changes in the unemployment rate had positive impacts on the number of DSP recipients. The biggest impact took place in the 1990-99 period, with an increase of 43,770 persons. As shown earlier, during 1990-99, the impact of the policy change was to increase the number of DSP recipients by 80,700. The impact of the 1980 policy change was very big, reducing the number of DSP recipients by 126,800 over the period 1979 to1990.

3.8. Conclusion

The theories suggest that worsening labour market conditions can lead to an increase in the number of applications for disability benefits. If the administrative authority has an accommodating policy, then the number of grants will further increase in response to an economic recession. This chapter tests these arguments using Australian data.

From the estimation results it is confirmed that worsening labour market conditions, represented by an increase in the unemployment rate, increases the application and grant rates of DSP benefits, which then leads to an increase in the number of DSP recipients. Simulated results show that changes in the unemployment rate over the period 1970 to 1999 could explain 40 percent of the increase in the number of DSP recipients over this period and its impact varies in different periods.

The impact of the unemployment rate on the application rate is larger than on the grant rate. It is also found that the total impact of the unemployment rate on the acceptance rate is positive. If there is no big lag between applications and grants, these findings together suggest that the economic recession could have drawn less eligible people to apply for DSP benefits.

In addition, the considerable lagged effect of the unemployment rate on applications may suggest that many individuals who are induced to apply for the benefit because of a recession may only do so after an extensive search for other sources of income, such as looking for a job.

Another important factor in determining application and grant rates over the last three decades is policy changes. The policy changes in 1980 and 1991 had a significant impact (in opposite directions) on both applications and grants. However, controlling for the impact of the unemployment rate, the 1987 policy change seemed to have had no expected impact. Policy changes in 1991 could explain 31 percent of the increase in the number of DSP recipients over the period 1990 to 1999. This is almost twice of the impact of the change in the unemployment rate over this period. No matter what the intentions were of the government at that time, the policy change in 1991 was a relaxation of the eligibility criteria. This is supported not only by a comparison of the new policy with the old one, but also by application response. As discussed earlier, applications respond to the tightness of screening. No matter what the reason is for this relationship, the dramatic increase in applications after the new policy in 1991 suggests that the eligibility criteria were relaxed. It is puzzling that, given the government's objective of containing the growth of the number of DSP recipients, it actually relaxed the eligibility criteria with the 1991 policy change.

Policy change in 1980 played a very important role in reducing the application and grant rates and containing the growth after that time. In contrast to the 1991 policy change, there was no legislative change in the eligibility criteria in 1980, yet it still effectively reduced applications and grants.

The cross-states-time-series data produce a significant coefficient with an expected sign on the variable that measures population structure change. This implies that population ageing will increase applications and grants. This result, however, is not confirmed with the aggregate time series only data. This is an important result because it contradicts considerable casual comment in the press and elsewhere which links population ageing to the growth of the DSP program. To date the impact of population ageing seems to be negligible.

All regression results show that the relative level of DSP benefit represented by the replacement rate has no impact on the application and grant rates. This does not mean that economic incentives are unimportant. It is just that over the period considered there had been little change in the replacement rate. There may be considerable incentive effects across programs in respect to benefit level, which makes DSP benefit more attractive than other income support payments.

Therefore, unemployment and policy changes are important in accounting for the growth of the DSP program over the last three decade. The level of DSP benefit and population structure change are not important.

Appendix 3A: Variations of variables by state

Figure 3.A1: The application rate by state

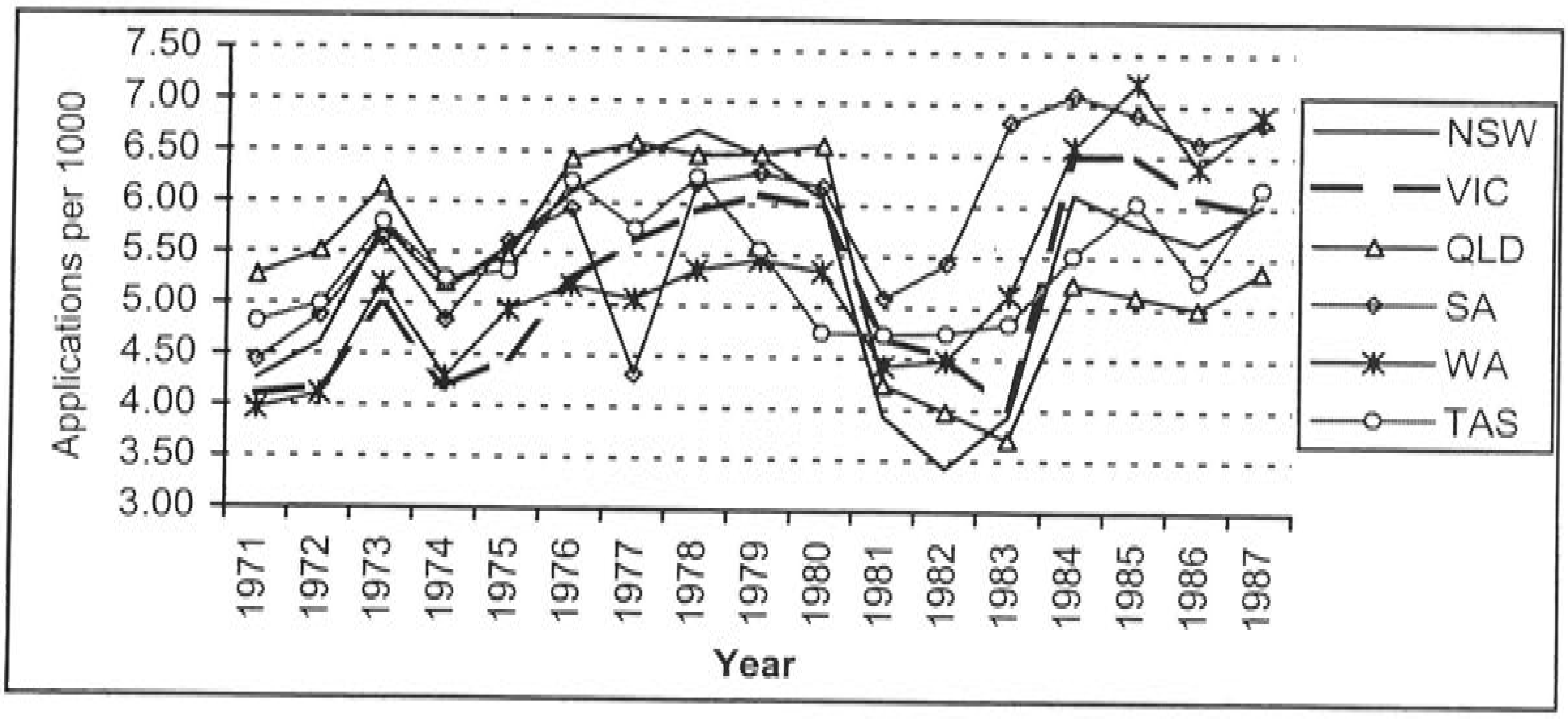


Figure 3.A2 : The grant rate by state

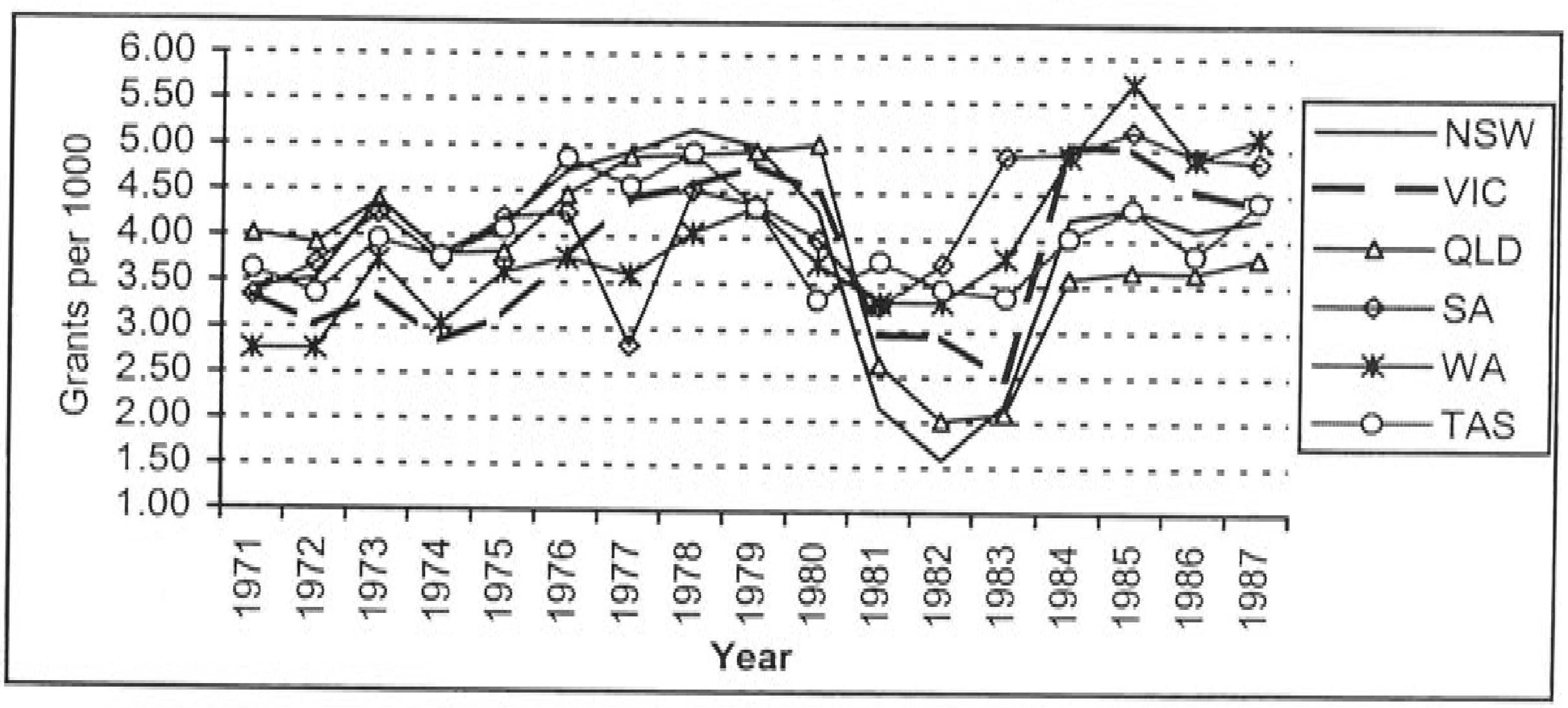


Figure 3.A3: The acceptance rate by state

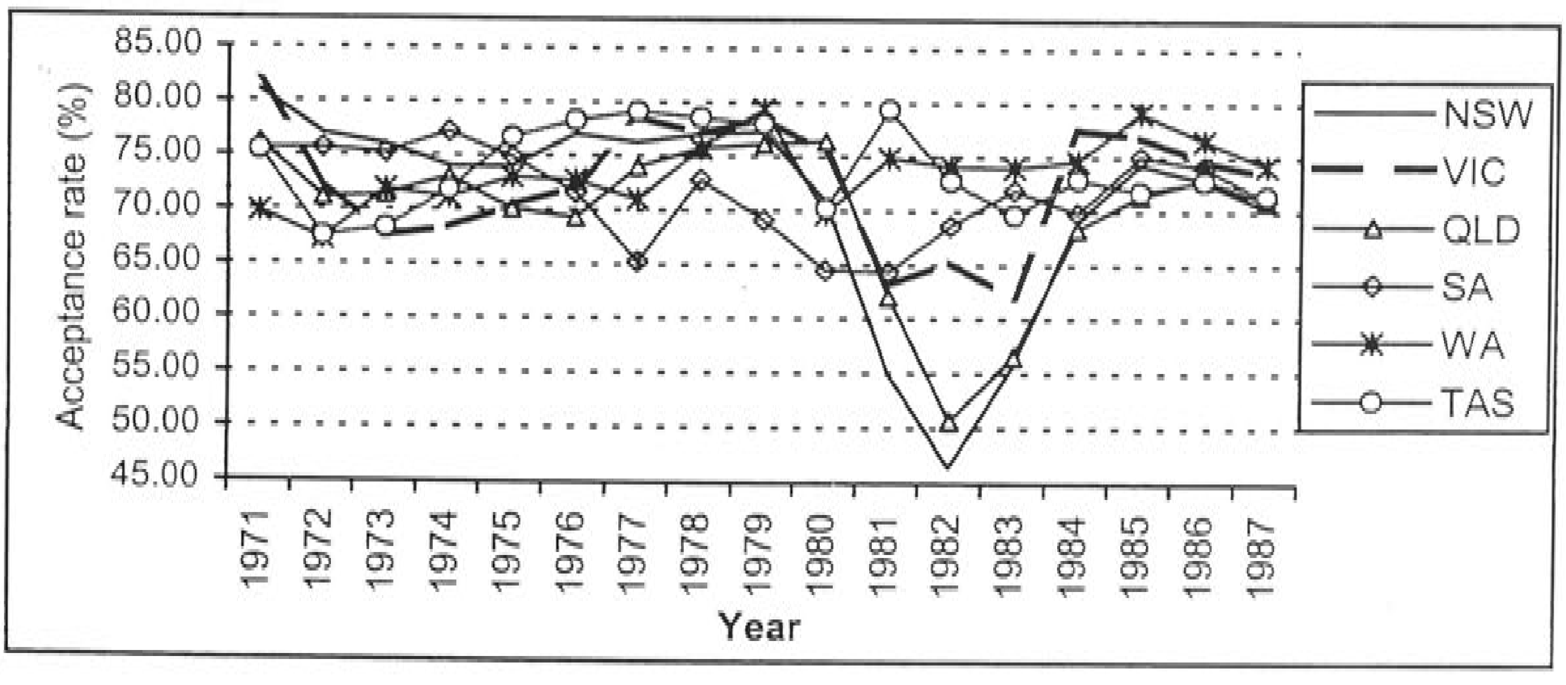


Figure 3.A4 : The population ratio (p50_pop) by state

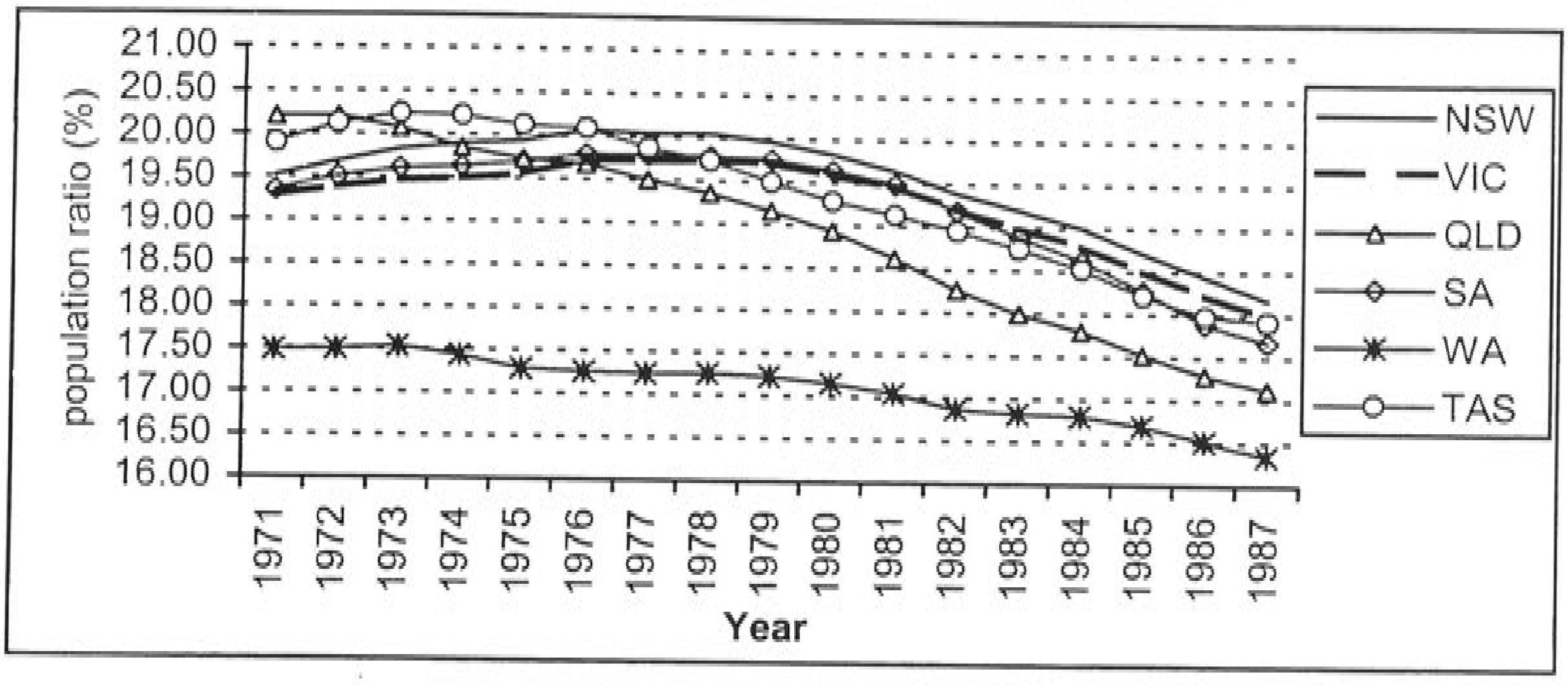


Figure 3.A5: The unemployment rate by state

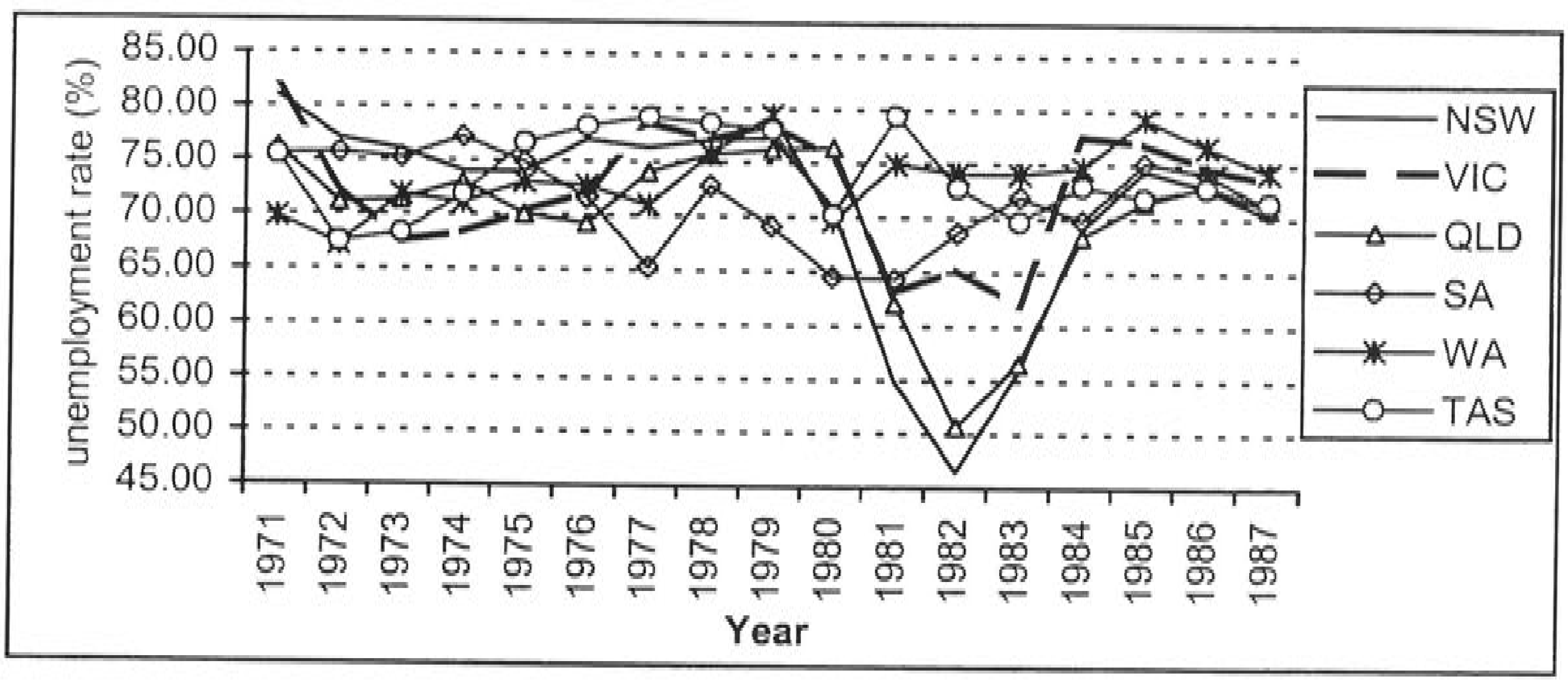
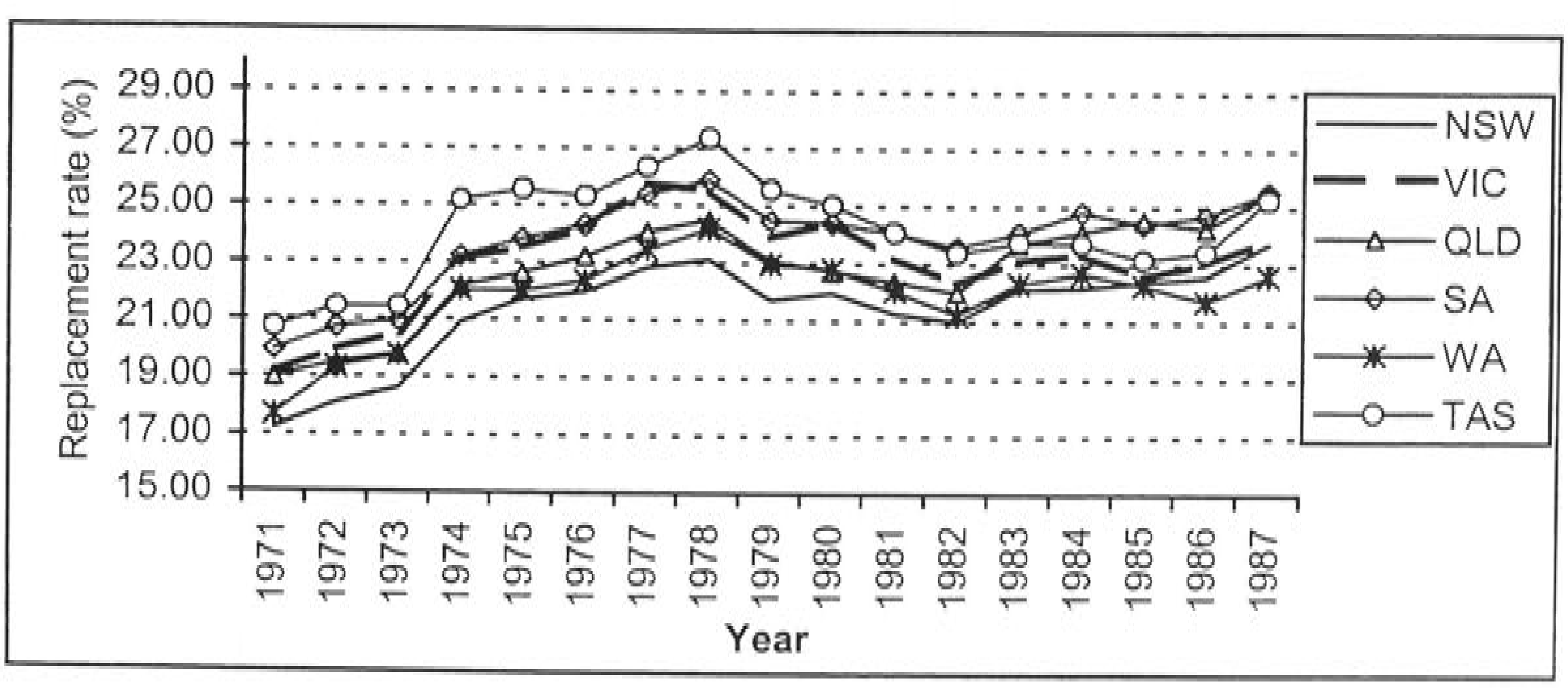


Figure 3.A6: The replacement rate by state



Appendix 3B

Table 3.A1: ADF test statistics for variable stationarity (time series only data)

	Test statistics					
	app_rate	**grant_rate**	**accept_rate**	**unem_rate**	**replace_rate**	**p50_pop**
level	- 0.70.	- 1.034	- 2.495	- 1.476	- 1.002	- 3.6111^
first difference	- 4.173***	- 4.776***	- 5.277	- 4.407***	- 5.150***	-

Note: 1: *** Significant at 1 percent level; ** at 5 percent level; * at 10 percent level.

2: ^ With time trend and 3 lagged differences.

Table 3.A2: ADF test statistics for level regression residuals stationarity (time series only data)

	application equation	**grant equation**	**acceptance equation**
Test statistics	- 8.649***	- 6.489***	- 5.277***

Note: *** Significant at 1 percent level; ** at 5 percent level; * at 10 percent level.

Table 3.A3: Residual means and standard deviations by state, from polled regression of the cross-states-time-series data

		NSW	VIC	QLD	WA	SA	TAS
application rate equation	Mean	-0.1329	-0.1006	-0.0555	0.1584	0.2708	-0.1403
	Std.Dev.	*0.7087*	*0.5772*	*0.7799*	*0.6636*	*0.6715*	*0.4443*
grant rate equation	Mean	-0.0969	-0.0177	-0.1441	0.1285	0.1470	-0.0168
	Std.Dev.	*0.7415*	*0.5994*	*0.7295*	*0.6170*	*0.6210*	*0.3532*

Table 3.A4: Cross-states correlation coefficients of residuals, from polled regression of the cross-states-time-series data

	NSW	VIC	QLD	WA	SA	TAS
(a). The application rate equation						
NSW						
VIC	0.0064					
QLD	**0.8396**	**0.4347**				
WA	**0.3094**	**0.7219**	-0.1512			
SA	0.014	-0.2089	-0.1779	**0.7113**		
TAS	-0.1327	**-0.3565**	**0.6047**	-0.0231	0.0945	
(b). The grant rate equation						
NSW						
VIC	-0.0654					
QLD	**0.8355**	**0.6389**				
WA	0.1255	**0.8099**	-0.255			
SA	0.0847	**-0.5642**	-0.0034	**0.6178**		
TAS	0.0378	-0.1015	0.2074	**-0.3075**	0.2046	

Note: Bold numbers indicate the absolute value of the correlation coefficient is greater than 0.3.

Table 3.A5: The grant rate equation using time series only data covering 1971-1995

	Time series only	
	Variable in level	In 1st difference
unem_rate	-0.0277	0.0867
	(0.1028)	(0.0771)
lag unem_rate	0.3865***	0.2122**
	(0.1053)	(0.0779)
p50_pop	- 0.3358	- 0.1279
	(0.3638)	(0.5454)
replacement rate	0.0866	0.0778
	(0.1048)	(0.1142)
time trend	- 0.1273	
	(0.0960)	
year_80	- 1.4425**	- 1.5518***
	(0.5074)	(0.4463)
year_87	0.3424	- 0.7162
	(0.5837)	(0.4552)
year_91	1.7800***	1.0157*
	(0.4727)	(0.4861)
constant	8.8048	- 0.0103
	(6.7716)	(0.1082)
Summary statistics of model specification		
No. of obs.	26	25
F(,)	13.72	6.30
Prob>F	0.0000	0.0009
R - square	0.8659	0.7219
Adj-R-square	0.8028	0.6074
D-W test	2.7557**	2.0032

Note: 1. Standard errors are in parentheses.

2: *** Significant at 1%; ** at 5%; * at 10%.

Appendix 3C:

Simulated grant rate, and number of DSP recipients if the unemployment rate is fixed at 1970 and 1971 levels and without 1991 policy change

Figure 3.A7: Actual, model predicted and hypothetical grant rates by fixing the unemployment rate at 1970 and 1971 levels and without 1991 policy change

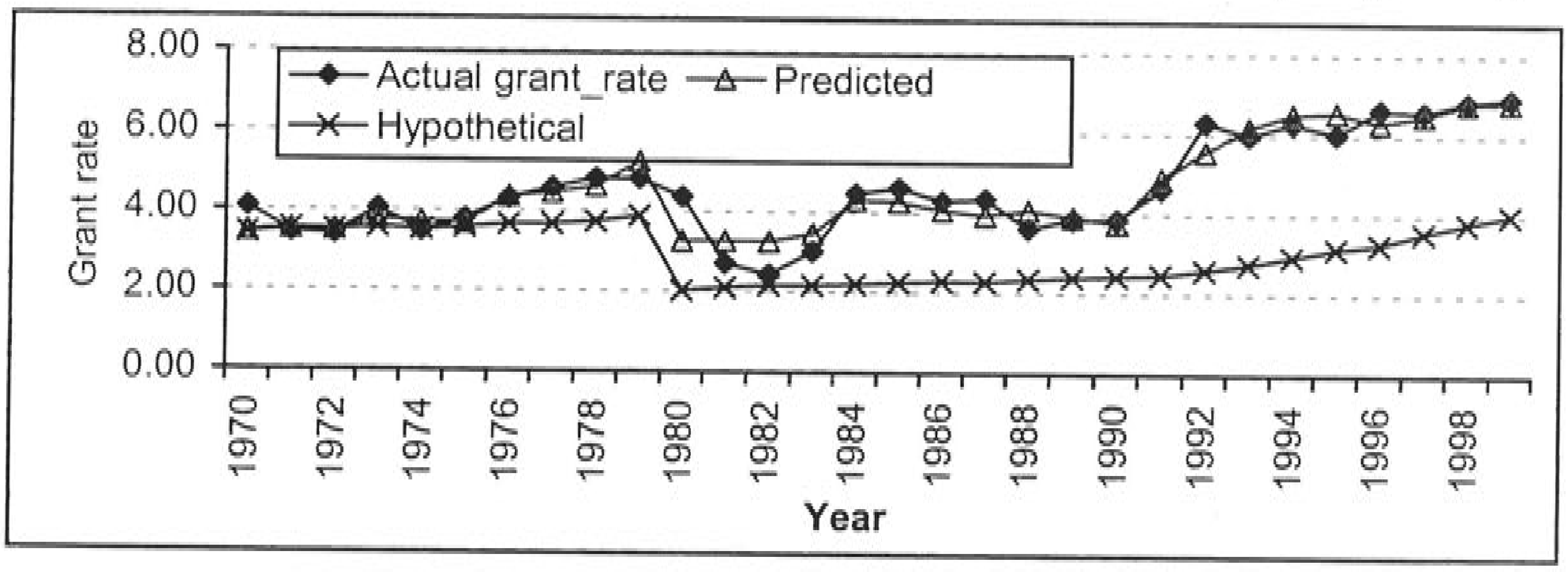
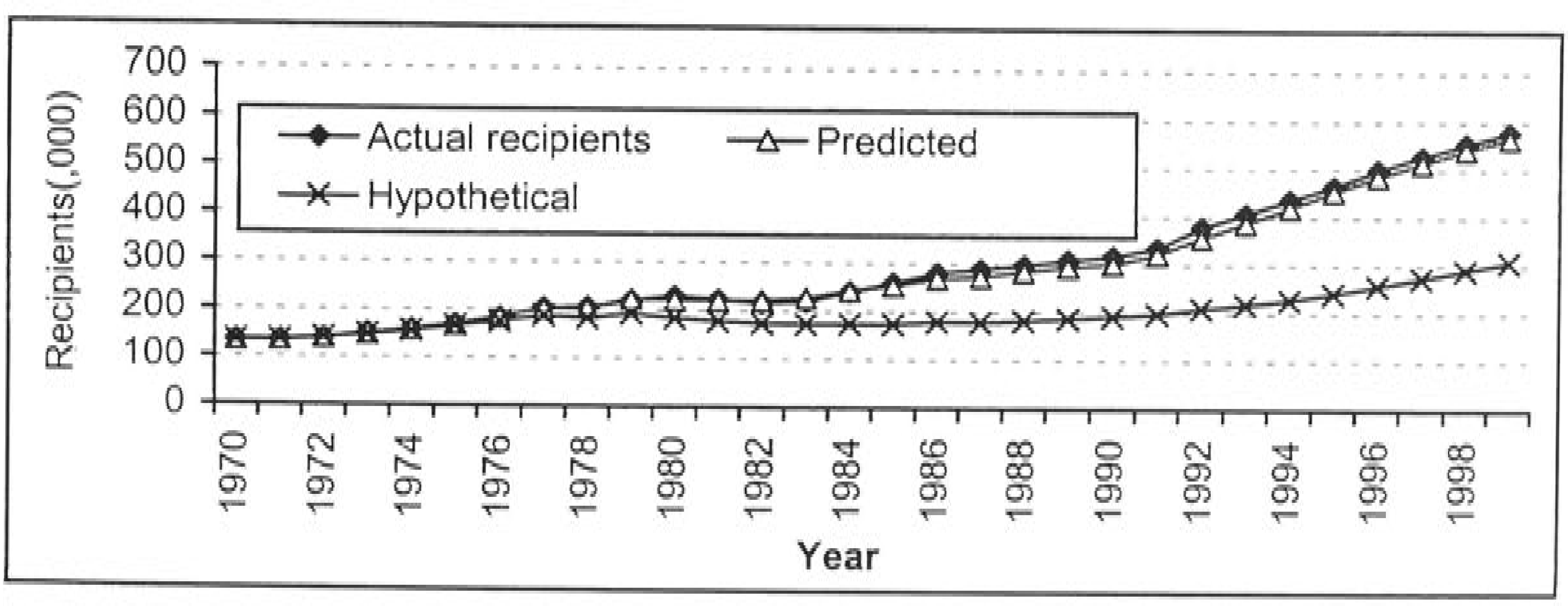


Figure 3.A8: Actual, model predicted and hypothetical numbers of DSP recipients by fixing the unemployment rate at 1970 and 1971 levels and without 1991 policy change



Appendix 3D:

Simulated application rate and number of applications

(1). Fixing the unemployment rate at 1970 and 1971 levels

Figure 3.A9: Actual, model predicted and hypothetical application rates by fixing the unemployment rate at 1970 and 1971 levels

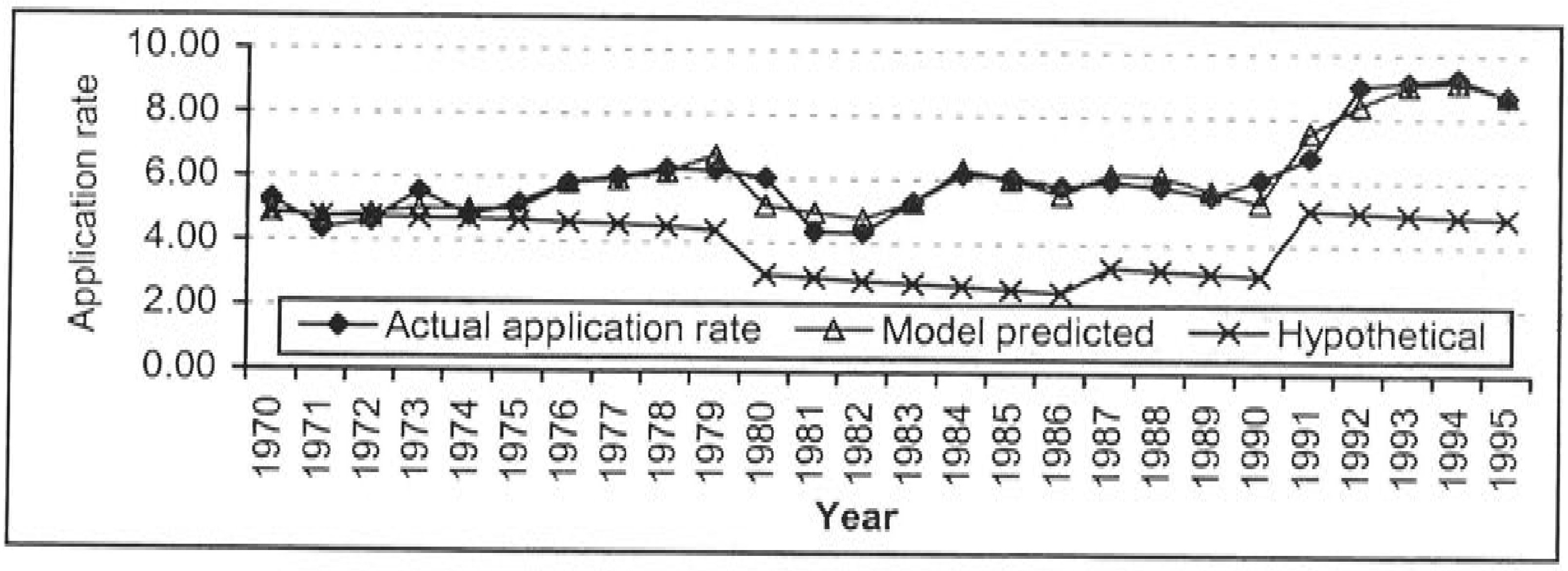
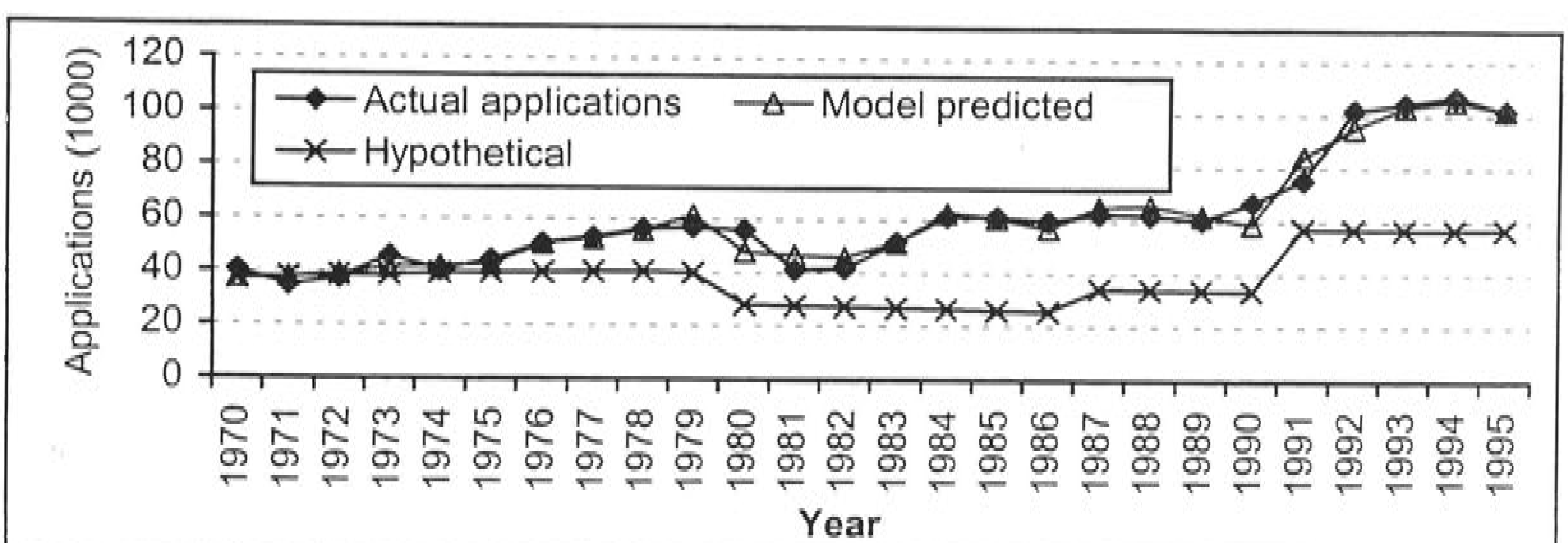


Figure 3.A10: Actual, model predicted and hypothetical numbers of applications by fixing the unemployment rate at 1970 and 1971 levels



(2). Without 1980 policy change

Figure 3.A11: Actual, model predicted and hypothetical application rates without 1980 policy change

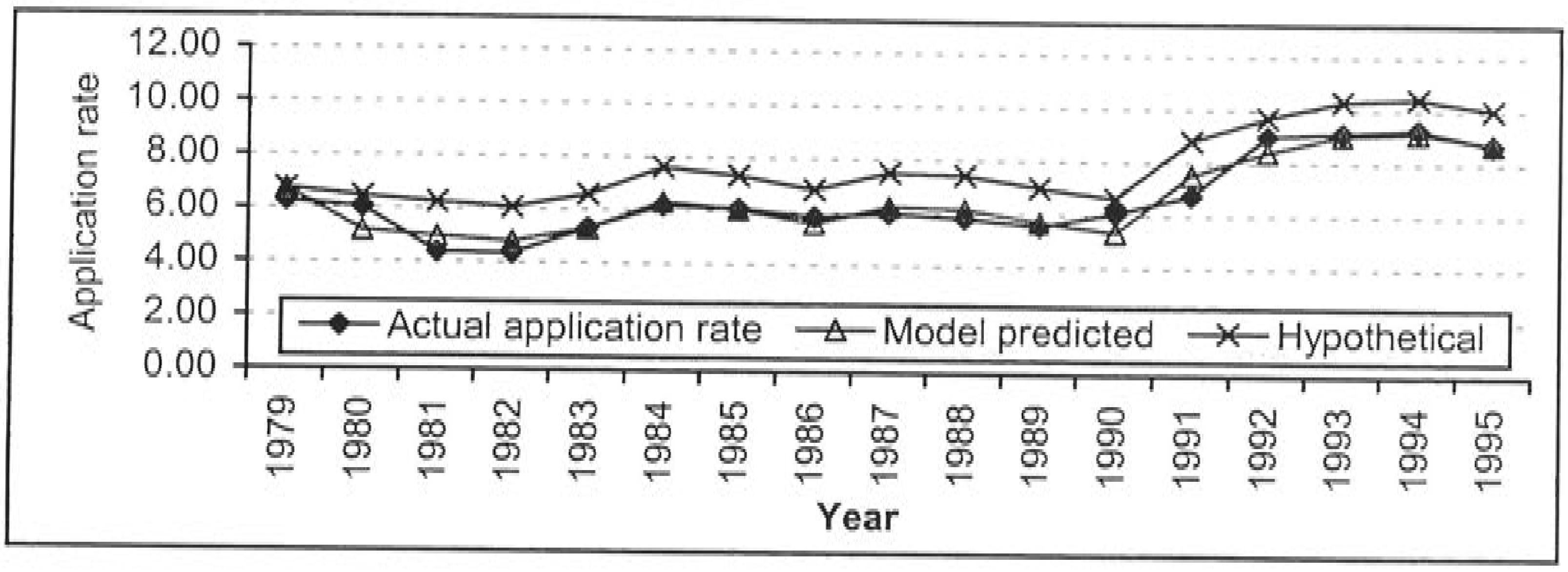
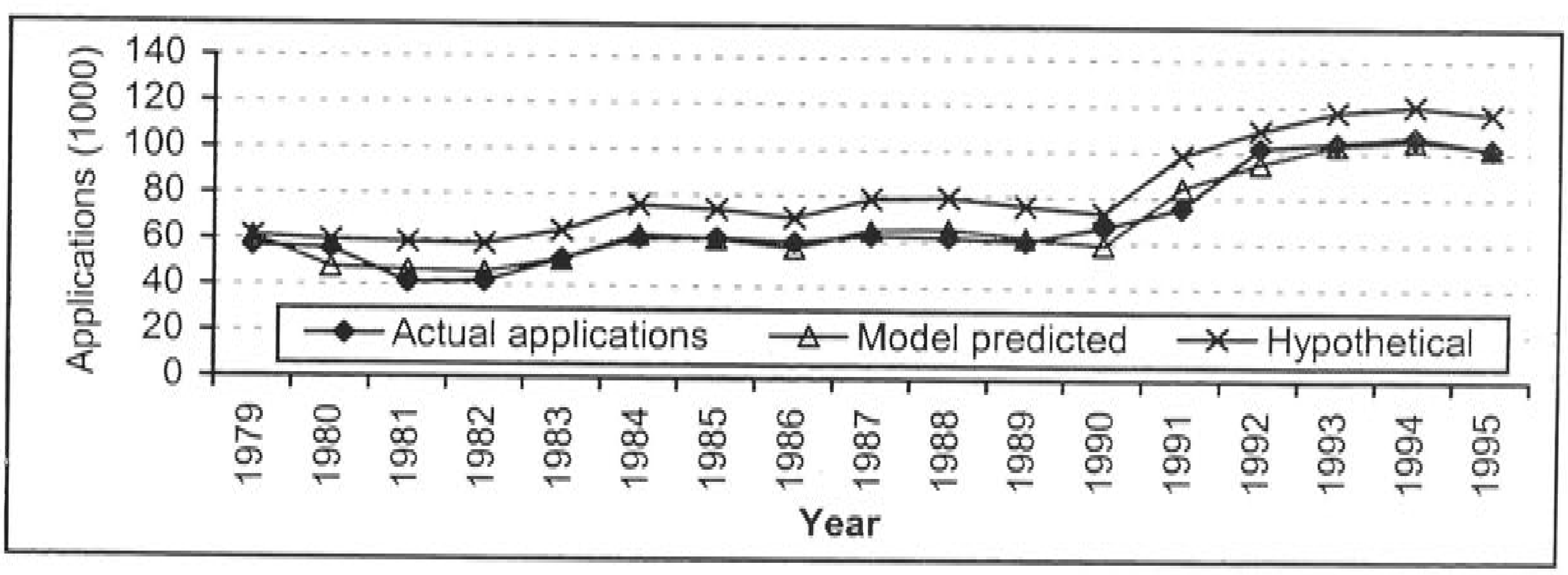


Figure 3.A12: Actual, model predicted and hypothetical numbers of applications without 1980 policy change



(3). Without 1991 policy change

Figure 3.A13: Actual, model predicted and hypothetical application rates without 1980 policy change

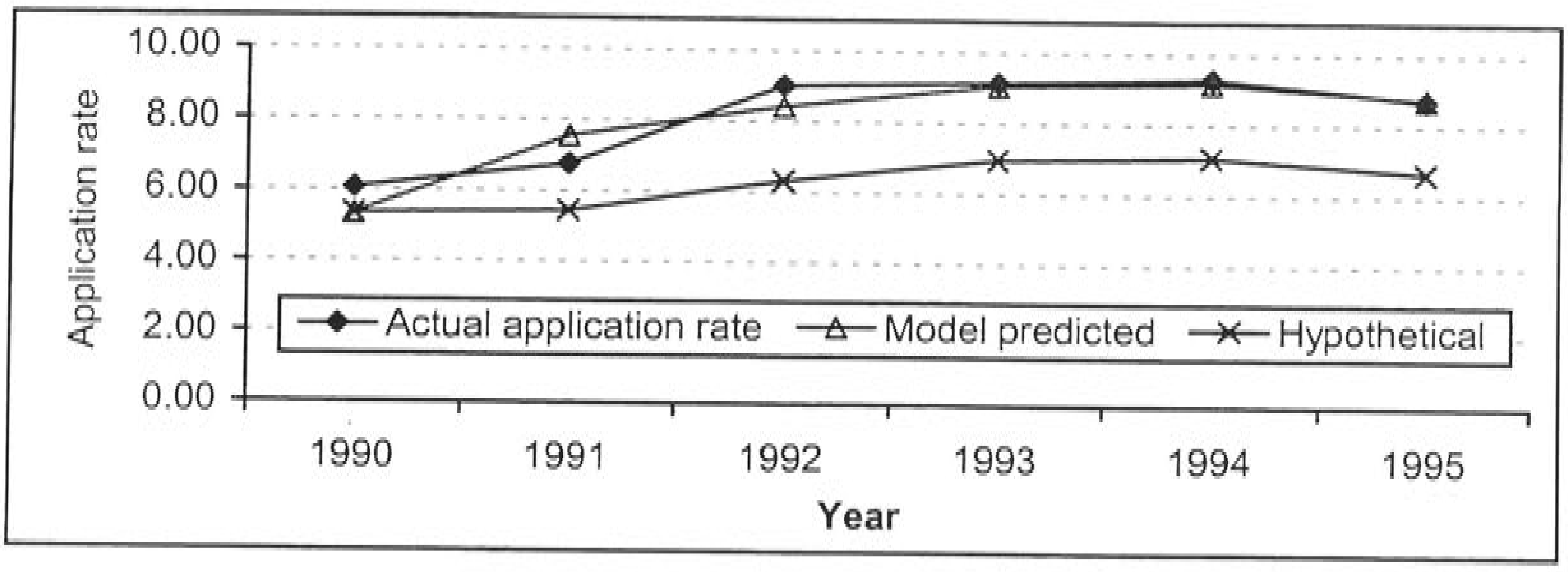
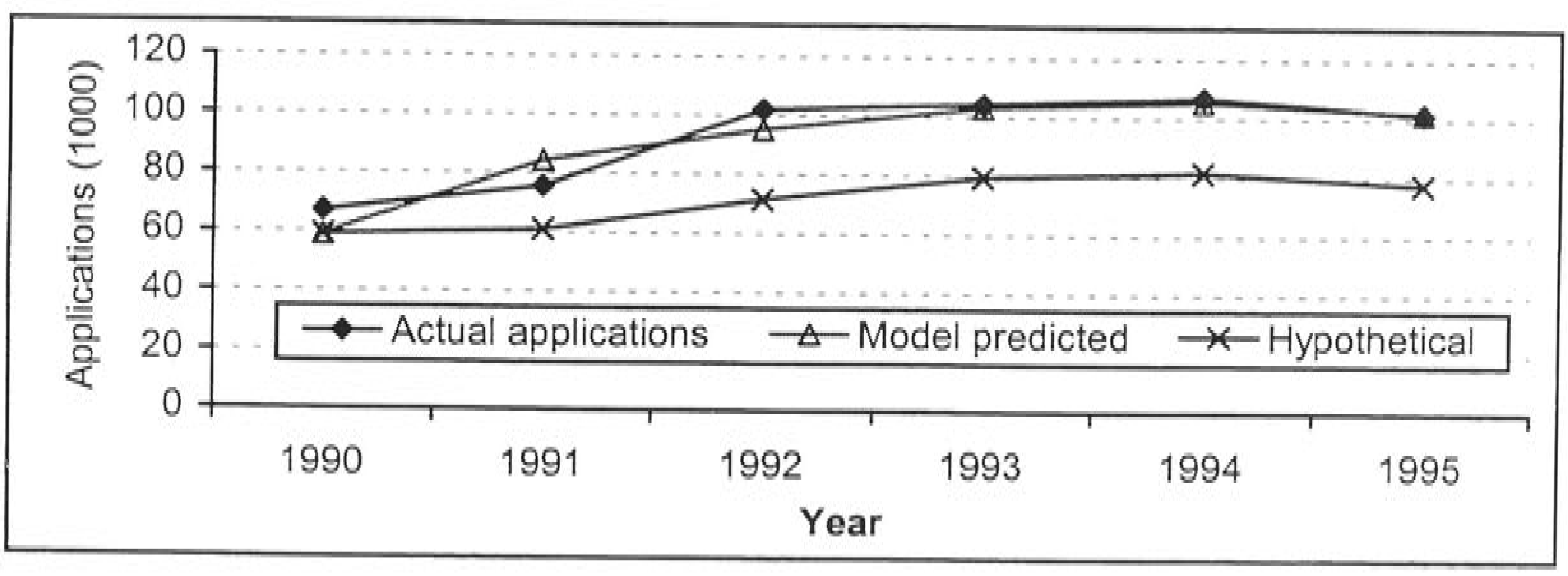


Figure 3.A14: Actual, model predicted and hypothetical numbers of applications without 1991 policy change



Chapter 4

Transition From Unemployment To DSP

4.1. Introduction

The number of DSP recipients at any given point in time is determined by recipient inflows and outflows. Earlier chapters used aggregate data to discover the determinants of inflows, such as labor market conditions, changes in policy, changes in benefit value and changes in population structure (population ageing). It appears that changes in policy and labor market conditions matter most as determinants of the growth of applications and grants of DSP benefits over the last three decades.

This chapter utilizes the administrative longitudinal data (LDS) at the Department of Family and Community Services (FaCS) to look more closely at the relationship between unemployment and DSP inflows.

For each financial year between 1995-96 and 1999-2000, the FaCS LDS data enable us to divide DSP inflows into former income support recipients and non-former income support recipients[1]. 60 to 65 percent of the DSP inflows each year were former income support recipients and of these, most were former unemployment benefit recipients (Table 4.1). Between 1995-96 and 1998-99, the proportion of DSP recipients who transferred from unemployment benefit increased from 23 percent to almost 50 percent. Up to September 1996, recipients of unemployment benefit who were temporarily incapacitated were transferred to sickness allowance. After some time on sickness benefits many transferred to DSP. After September 1996, this practice was terminated and temporarily incapacitated recipients on unemployment

[1] Here, the former income support recipients refer to those who transferred from other income support payments to DSP benefit. Thus the non-former income support recipient defined here might have income support recipiency experience before. But if they were not receiving income support payments the fortnight prior to entering DSP, they are not regarded as former income support recipients.

benefit remained there rather than transferring to sickness benefit. The sharp increase in the transition from unemployment to DSP from 1995-96 to 1996-97 reflects this change. It suggests that most of the transitions from sickness benefit to DSP in 1995-96 subsequently became transitions from unemployment to DSP.

Table 4.1: Composition of DSP inflows[2], 1995-96 to 1999-2000

	Former income support recipients (%)		Non former income
Year	Unemployment	Others	support recipients (%)
1995-96	23.1	36.2	40.7
1996-97	41.6	23.4	35.0
1997-98	43.2	16.4	40.4
1998-99	49.1	14.3	36.6
1999-00	45.9	12.9	41.3

Looking at outflows from unemployment benefit is another way of illustrating the importance of the relationship between unemployment and DSP. Table 4.2 presents the proportions of transitions of unemployment benefit recipients to different income support payments and shows that among those who transferred from unemployment benefit to all other income support payments, transition to DSP consists of over one quarter for the most recent three financial years. This proportion was lower for the 1995-96 and 1996-97 financial years, perhaps because incapacitated unemployment benefit recipients were allowed to transfer to sickness benefits before September 1996 as noted above. The transition proportions to DSP are different for different age groups as shown in Table 4.A2 in Appendix 4A. For those under age 60 the proportion of transitions to DSP from unemployment increases with age. For the age group 51-60, one half or more of those who transferred to other income support payments from unemployment benefit recipiency transferred to DSP.

[2] See Table 4.A1 in Appendix 4A for a detailed by age group composition.

Table 4.2: Composition of transitions from unemployment benefit to other income support payments

Year	DSP	SK	SPP	AGE	Others
1995-96	13.7	25.0	14.0	8.6	38.7
1996-97	22.9	10.5	13.1	9.2	44.3
1997-98	29.0	7.5	16.2	10.0	37.3
1998-99	27.5	6.4	16.5	8.6	41.0
1999-00	27.3	2.5	18.8	8.2	43.3

Note: (1) DSP – Disability Support Pension; SK – Sickness Benefits; SPP – Sole Parent Pension; AGE – Age Pension.

(2) Transition from unemployment benefit recipiency to Age Pension only took place for persons aged 60 and over. See Table 4.A2 in Appendix 4A.

To gain a better understanding of this unemployment to DSP transition, Table 4.3 presents the proportion of the unemployment benefit recipients who transferred to DSP by age for the last five financial years. The number of unemployment benefit recipients was as in June of each financial year. Overall those who transferred from unemployment benefit to DSP consisted of 3-4 percent of the unemployment benefit recipients. But, for the older age group 51-60, it was over 10 percent. Also note that for age under 61, the proportion of transitions increased between 1995-96 and 1998-99.

The implication of Table 4.3 is that the older the unemployed the higher the probability of transition to DSP from unemployment. To further confirm this point, Table 4.4 presents the age distribution of those who transferred to DSP from unemployment over the last five financial years. This type of transition was proportionally much higher among the older age groups. The proportion in the 41-50 age group was one quarter, while for the 51 to 60 age group the proportion was one third or more.

Table 4.3: Proportion of unemployment benefit recipients who transferred to DSP, 1995-96 to 1999-2000

Year	Age	DSP
1995-96	<=30	0.5
	31-40	1.7
	41-50	3.5
	51-60	8.4
	61 & over	1.2
	sub-total	2.1
1996-97	<=30	1.3
	31-40	2.3
	41-50	5.8
	51-60	10.5
	61 & over	5.3
	sub-total	3.5
1997-98	<=30	1.8
	31-40	3.5
	41-50	6.7
	51-60	12.0
	61 & over	3.5
	sub-total	4.2
1998-99	<=30	1.0
	31-40	4.4
	41-50	8.5
	51-60	13.7
	61 & over	4.1
	sub-total	3.7
1999-2000	<=30	1.0
	31-40	4.2
	41-50	7.5
	51-60	12.5
	61 & over	5.3
	sub-total	3.6

Table 4.4: Age distribution of the former unemployed who transferred to DSP

Age	1995-96	1996-97	1997-98	1998-99	1999-2000
<=30	10.9	17.1	19.9	16.0	17.2
31-40	15.8	12.7	16.6	17.6	16.7
41-50	25.0	25.4	25.3	28.2	26.2
51-60	45.1	35.9	33.5	33.3	32.8
61 & over	3.3	8.9	4.6	4.9	7.1

Transition to DSP from unemployment is very important and worth detailed examination to enhance our understanding of DSP inflows. This chapter examines this aspect of DSP inflows and is set out as follows: section 2 explores the pre-transition experiences of those who transferred to DSP from unemployment; section 3 applies a multinomial logit model to the 1995-96 unemployment cohort to identify the factors that determine the transition from unemployment benefit recipiency to DSP; and section 4 sets out the conclusions.

4.2. Pre-transition experiences of those who transferred to DSP from unemployment

The fact that a large proportion of DSP recipients come from unemployment benefit recipients raises questions about the relationship between individuals' labor market experiences and their health conditions. One possibility is that unemployment benefit is merely a 'hold-on' benefit for DSP in the sense that people receive unemployment benefit while waiting for the grant decision on their applications for DSP. Under these circumstances the transition from unemployment to DSP is an administrative practice and not of special economic interest. To see whether the unemployment benefit is simply a 'hold-on' benefit for those who transferred to DSP from unemployment, two approaches are used to examine the pre-transition experiences of those who transferred to DSP from unemployment benefit: (i) following the 1995-96 unemployment cohort to document the experiences of this cohort who subsequently transferred to DSP; (ii) tracing back the 1999-2000 transition cohort (from unemployment to DSP) to examine their pre-transition experiences.

The basic underlying hypothesis is as follows: if the unemployment benefit is a 'hold-on' benefit, the pre-transition unemployment duration should approximately equal the time needed by the program administrative authority (i.e., Centrelink) to process a DSP application[3]. In addition, we might expect that the DSP transferees would have only one income support recipiency spell prior to transition.

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[3] The implicit assumption is that the transferring persons lodge their DSP benefit applications when they start to receive unemployment benefits.

The 1995-96 unemployment cohort is defined as those people who entered the unemployment benefit program (and also entered the LDS data set) between 1 July 1995 and 30 June 1996. If there were multi-entries during this financial year, the first entry is used. If left-censored persons on 1 July 1995 restarted their unemployment benefit recipiency during the 1995-96 financial year, they are included in the cohort. Other left-censored unemployment benefit recipients are excluded. Restarting an unemployment benefit spell is defined as returning to unemployment benefit after more than one fortnight's interruption in benefit recipiency. This cohort is followed to 16 June 2000 when the data set ends.

First, Table 4.5 presents the observed destinations of the 1995-96 unemployment cohort. Four destinations are differentiated: transition to DSP, transition to other income support payments, exit from unemployment benefit without transition to other income support payments (referred to as 'exit all payments' later) and still on the unemployment benefit program at the end of the data set window (i.e. 16 June 2000). The four destinations are the most recent status of the cohort which can be observed within the data set window. Changes in payment types and in benefit recipiency status might occur over the period between entry into the unemployment benefit program and the latest observed destination. For instance, for a person whose latest destination was still on the unemployment benefit, over the observable period the person might have received other income support payments and/or might exit the income support system due to work or other reasons for a while, but on the last date of the data set the person was still receiving unemployment benefit[4].

[4] In this definition of the observed destination, transition to DSP from unemployment is not a direct transition in the sense that the person is on unemployment benefit just before being granted DSP benefit, since an individual may transfer to other income support payments from unemployment and then transfer to DSP. While for the 1995-96 unemployment cohort whose observed destinations were DSP recipiencies, most of them had transferred to DSP directly from unemployment, but there were some persons who entered into DSP from other income support payments.

Table 4.5: Distribution of observed destinations of the 1995-96 unemployment cohort

Age groups	<=30	31-40	41-50	51-60	60 & over	Total
To DSP	2.2	5.9	10.9	20.2	1.9	5.5
To other payments**	13.7	12.5	10.4	12.6	0.6	12.8
Still on unem benefit	22.5	23.8	25.1	35.9	91.3	25.1
Exit all payments	61.6	57.8	53.6	31.3	6.3	56.7

** To other payments does not include those who transferred to the Age Pension.

Over the observable period of the 1995-96 unemployment cohort, 5 percent had transferred to DSP, 13 percent had transferred to other income support payments, 57 percent had exited all payments and 25 percent were still receiving unemployment benefits on 16 June 2000 (the end of the data set). For different age groups the observed destinations differ. For the four age groups under 61, the proportion of transition to DSP and still on unemployment benefit increases with age and the proportion exiting all payments decreases with age. For the 51-60 age group, more than 20 percent had transferred to DSP and only one-third exited all payments.

The 1999-2000 transition cohort includes those whose transitions from unemployment benefit recipiency to DSP took place between 1 July 1999 and 30 June 2000. Here all transitions were direct transitions in the sense that individuals were on unemployment benefit just before entering into the DSP program. This cohort was traced back as far as the data permitted, which is 6 January 1995.

From the FaCS one percent sample LDS data, 344 persons had transferred to DSP benefit from unemployment benefit during the financial year 1999-2000[5], of which 76 percent started with unemployment benefit, ended with DSP with no payment type change between; 7 percent started with unemployment benefit, changed to other payment types, then returned to unemployment benefit again before transition to DSP;

[5] The number of transitions was greater than the number of persons who transferred (344) since a few people had transferred more than once during the year. In this case only the first transition is considered.

17 percent started with other payment types, moved to unemployment benefit and then transferred to DSP.

For the two cohorts, over the observable period, it would be useful to know how may spells they had on the income support payment system? What was the duration of the last unemployment benefit spell prior to the transition and the duration distribution and what was the total time spent on the income support payment system prior to the transition[6]?

Table 4.6 presents the distribution of the number of spells on all income support payments prior to transition to DSP. Of the 1995-96 unemployment cohort who transferred to DSP half of them had more than one income support spell[7] and 28 percent had 3 or more spells. The proportion of those having one spell increased with age for persons under 61 years of age. For the 1999-2000 transition cohort, those having more than one spell were 67 percent and more than 40 percent had 3 or more spells. A large proportion of the 51-60 age group had one spell and for the younger age groups this proportion decreased with age. The interruption of the spells might be caused by many things, such as the activity test requirements, or returning to work.

[6] For the 1995-96 unemployment cohort, only the experiences of those who directly transferred to DSP from unemployment are examined.

[7] Obviously, for those who had only one spell, this spell was an unemployment spell.

Table 4.6: Distribution of the number of income support spells prior to transition to DSP

Age*	Number of spells 1 spell	2 spells	3 spells	4 spells	5 & over
(a) 1995-96 unemployment cohort who transferred to DSP					
<=30	31	25	19	15	10
31-40	45	27	12	6	10
41-50	55	26	9	9	1
51-60	63	20	10	4	3
61 & over	33	67	0	0	0
All	50	25	13	9	6
(b) 1999-2000 transition cohort					
<=30	26	20	11	18	25
31-40	24	29	17	17	13
41-50	19	34	26	8	12
51-60	44	21	14	12	9
61 & over	70	19	7	0	4
All	33	25	17	12	13

* The definition of age for the 1995-96 unemployment cohort is different from that for the 1999-2000 transition cohort. For the former it refers to the age on entering into unemployment in 1995-1996, but for the latter it refers to the age at the time of transition from unemployment to DSP.

Table 4.7 presents the duration distribution of the last unemployment spell prior to transition to DSP[8,9]. For the 1995-96 unemployment cohort who transferred to DSP, only 19 percent had a last unemployment spell duration of less than three months (6 fortnights); 66 percent had a last unemployment spell duration for more than half a year (more than 14 fortnights); and 42 percent experienced durations of more than one year (26 fortnights).

[8] Unlike in Table 4.6, in Tables 4.7 and 4.8 only those who had directly transferred to DSP from unemployment are included.

[9] In the LDS data set, if unemployment benefit recipients changed the unemployment payment type, say from Youth Allowance to Newstart Allowance, their current unemployment duration was recounted. But in this Chapter, changes in payment type within the unemployment benefit do not lead to a recounting of the duration if there is not more than one fortnight interruption in benefit recipiency.

Table 4.7: Duration distribution of the last unemployment spell prior to transition to DSP

	Duration interval (fortnights)				
Age	<=6	7-14	14-20	21-26	>26
(a) 1995-1996 unemployment cohort who transferred to DSP					
<=30	19	15	15	12	39
31-40	19	19	12	9	42
41-50	19	14	10	10	46
51-60	16	13	14	15	41
All	19	15	12	12	42
(b) 1999-2000 transition cohort					
<=30	29	12	15	9	34
31-40	32	13	10	5	44
41-50	28	19	11	7	34
51-60	26	14	9	6	46
All	28	16	10	6	39

For the 1999-2000 transition cohort, a larger proportion (28 percent) had a last unemployment spell duration of less than three months (6 fortnights), but still more than half of this cohort had a duration of more than six months and 39 percent a duration of more than one year.

For the 15-month period before October 1998, Centrelink was able to process 83 percent of applications within 49 days (three and a half fortnights) [10]. Table 4.7 therefore indicates that most people who transferred to DSP from unemployment benefit cannot be regarded as individuals subject to a 'hold on' benefit.

Table 4.8 presents the average duration of the last unemployment spell. For the 1995-96 unemployment cohort who transferred to DSP from unemployment benefit, on average the duration of the last unemployment spell was about 30 fortnights, more than one year. The difference between age groups is small. The average duration for the 1999-2000 transition cohort was 36 fortnights, longer than that of the 1995-96 unemployment cohort.

[10] Centrelink Performance Report, September-October, 1998.

Table 4.8: Average duration of the last unemployment spell

Age	Average duration (fortnights) 1995-96 unemployment cohort	1999-2000 transition cohort
<=30	29	24
31-40	28	42
41-50	32	30
51-60	30	47
All	30	36

Table 4.9 presents the average duration of the last unemployment spell of the 1999-2000 transition cohort by breaking the cohort into those who changed or did not change payment types between the first observable date and the transition date. For those who did not change payment types, the average pre-transition duration was very long, half a year longer than those who changed payment types.

Table 4.9: Average duration of the last unemployment spell prior to transition by whether having changed payment type, 1999-2000 transition cohort

Age	Without changed payment type	With changed payment type: Start with unemployment	With changed payment type: Start with other payment types
<=30	22	33	27
31-40	49	36	26
41-50	42	16	18
51-60	48	25	47
61 over	28		19
All	40	25	27

Table 4.10 presents the total time on the income support system before transition to DSP. The 1995-96 unemployment cohort who transferred to DSP, over the observable period, on average spent 47 fortnights (about 1.8 years) on the income support system prior to transition to DSP, a period of 18 fortnights longer than the average duration of the last unemployment spell.

Table 4.10: Total time on income support over the observable period

Age	Total time on income support (fortnights)	
	1995-96 unemployment cohort	1999-2000 transition cohort*
<=30	55	48
31-40	51	63
41-50	47	61
51-60	39	38
All	47	47

* For the 1999-2000 transition cohort, only recipients who were not left censored are included in this calculation.

The implication of the above description should be clear: for the majority of those who had transferred to DSP from unemployment, the unemployment benefit is unlikely to be a 'hold-on' benefit. This then implies that there is a link between unemployment and DSP participation. This link is not simply that being unemployed reduces the opportunity cost of participation in DSP. The fact that 40 percent of those who transferred from unemployment to DSP had more than one year unemployment benefit duration just prior to the transition and on average spent more than one year on unemployment benefit suggests a relationship between duration of unemployment and DSP participation. This is explored in the next section.

4.3. Determinants of transition from unemployment to DSP

This section employs a multinomial logit (MLG) model[11] to identify the factors that determine the transition from unemployment to DSP, using the sample of the 1995-96 unemployment cohort. The model can be regarded as being based on individual choices. Suppose an unemployed person is faced with three choices[12]: transfer to DSP, transfer to other income support payments, or exit from unemployment benefit without transition to other payments (referred to as 'exit all payments') (probably

[11] See Appendix 4C for a brief description of the MLG model. For a detailed discussion, see Agresti (1990), Greene (1993), and Hoffman and Duncan (1988).

[12] When applying the model, those still on unemployment benefit were excluded. There are two reasons for this. First, their final destination is not clear, e.g. some may transfer to DSP later than the end of the data set. Second, duration on unemployment benefit is an explanatory variable in the model estimation, but duration of this group was incompleted.

return to work)[13]. Each choice has a choice specific expected value (option value), which is determined by the income associated with the choice, leisure and other individual characteristics. Use V_{DSP}, V_{Oth}, V_{Exit} to denote values associated with choice of transition to DSP, choice of transition to other income support payments, and choice of exiting all payments, respectively. An individual makes a choice by maximizing utility. Or equivalently, an individual chooses the option which provides the highest expected option value. For example, a person will choose to transfer to DSP if $U(V_{DSP}) \geq \max\{U(V_{Oth}), U(V_{Exit})\}$, or equivalently if $V_{DSP} \geq \max\ \{V_{Oth}, V_{Exit}\}$. In the multinomial logit model, the probability of a person choosing one option follows a logit distribution. In the context of this chapter, the model estimates the impact of the explanatory variables on the probability of transition to one destination relative to the probability of another destination.

4.3.1. Summary statistics of the sample

The summary statistics for the 1995-96 unemployment cohort by destination are presented in Table 4.11[14]. Of the 1995-96 unemployment cohort, 8582 persons had left unemployment benefits. Of these 7.27 percent transferred to DSP, 17.04 percent transferred to other income support payments and 75.69 percent exited unemployment benefit without transition to other income support payments.

[13] The assumption is that the unemployed cannot stay on unemployment benefit forever. This is not true in practice of the Australian income support system. Ideally, individuals having transferred to DSP should not only be compared with those who transferred to other income support payments and those having exited the income support system, they should also be compared with those who chose to stay on unemployment benefit. But as noted in footnote 12, those who chose to stay on unemployment cannot be clearly defined. In theory, for an unemployed person who is eligible for DSP, their decision is really between applying for DSP and returning to work, since not only is the unemployment benefit lower than the DSP benefit, also there are activity test requirement for receiving unemployment benefit.

[14] Although those of the 1995-96 unemployment cohort who was still on unemployment benefit is omitted in the model estimation, summary statistics for this group are presented in Table 4.A4 in Appendix 4A for comparison.

Table 4.11: Summary statistics by exit destination of the 1995-96 unemployment cohort who left unemployment benefits

	All	Transition to DSP	Transition to other	Exit all payments
Number of persons in sample	8582	624	1462	6496
As percent of total		7.00	17.00	76.00
Duration on unemployment* (fortnights)	34(28)**	44 (29)	34 (28)	33 (28)
Demographic characteristics				
Male (%)	63	71	32	69
Age at entry into unemployment	30 (112)	41 (12)	30 (11)	29 (10)
Male	31 (11)	41 (13)	32 (10)	30 (10)
Female	29 (11)	41 (11)	29 (12)	27 (10)
Marital status_couple (%)	27	31	32	25
Australian born (%)	78	72	76	78
Proportion having children (%)	15	12	17	14
Number of children	2 (1)	2 (1)	2 (1)	2 (1)
Age of the youngest child	5 (4)	7 (5)	5 (4)	5 (4)
Home ownership and rent type				
Home owner (%)	17	29	16	17
Government rent (%)	3	8	5	2
Private rent (%)	35	34	39	34
Free rent (%)	19	10	15	21
Other rent (%)	43	48	40	43
Financial variables				
Earned income>0 (%)	57	32	47	62
Average earned income***	157 (517)	92 (133)	126 (171)	166 (565)
Unearned income>0 (%)	12	21	11	12
Average unearned income***	59 (135)	68 (164)	60 (88)	57 (138)
Activity test requirement at entry				
Incapacity or rehabilitation****(%	2	12	2	1
Job search (%)	97	86	96	98
Others (%)	1	1	2	1

Note: * Duration on unemployment benefit over the observable period, not duration of the last unemployment spell.

** Standard deviations are in parentheses.

*** Average earned and unearned income per fortnight for those who have them.

****Activity test requirement at the time on entering into unemployment benefit.

Except for the duration and financial variables, the values of all other variables are as at entry into unemployment benefits. For the financial variables, the average over an individual's unemployment period is used.

On average the 1995-96 unemployment cohort had an unemployment experience of 34 fortnights (1.3 year) before leaving, and those who transferred to DSP had an unemployment experience that was 10 fortnights longer (43.9 fortnights) than the cohort average. Those who exited all payments (i.e. who exited unemployment benefit without transition to other income support payments) had the shortest unemployment experience (33 fortnights) over the observable period. Of those who transferred to DSP, a large proportion was male; while among those who transferred to other income support payments a greater proportion was female[15]. The average age at entry into unemployment benefit of this cohort was 30 years old. Although those who transferred to DSP were older on average than those who transferred to other income support payments, a slightly higher proportion of the latter (32 percent) was married than the former (31 percent). A slightly higher proportion of those who transferred to DSP were immigrants and a slightly lower proportion of this group had a dependent child. However, for those who had children, the average age of the youngest child of those transferred to DSP was relatively older than that of those who transferred to other income support payments and who exited all payments. This is consistent with the fact that the group who transferred to DSP was older at entry into unemployment benefit.

As for home ownership, 17.34 percent of this cohort were homeowners. The proportion of homeowner of those who transferred to DSP was higher than the proportion of homeowner among those who transferred to other income support payments and who exited all payments. A higher proportion of those who transferred to DSP rented government accommodation, while the proportion living in free accommodation was lower among this group.

[15] Most of those who transferred to other income payments transferred to the Sole Parent Pension.

The financial variables were evaluated as the average (per fortnight) over the period on unemployment benefit. On average 57 percent of this cohort had earned income[16] while receiving unemployment benefit and for those who had earned income the average earned income was $157 per fortnight. Not surprisingly, a greater proportion of those who exited all payments had earned income (62 percent) and they also earned the most (average $166 per fortnight), while those who transferred to DSP had the lowest proportion with earned income (32 percent) and they earned the least ($92 per fortnight). In contrast, those who transferred to DSP had a higher proportion with unearned income (21 percent) than the other two groups. The amount of unearned income was similar for the three groups.

The data set provides information on activity test requirements for this cohort when entering into unemployment benefit recipiency. With the presumption that those who were subject to the incapacity or rehabilitation related activity test might indicate the existence of some kind of disabilities, the activity tests were divided into three groups: *incapacity or rehabilitation* (including all the incapacity and rehabilitation related activity tests[17]), *job search* (the most frequent activity test requirement), and *the others*. Appendix 4B presents a detailed list of the activity test requirements for unemployment benefit recipients. An individual may experience activity test type change over the time of receiving unemployment benefit, but the reported activity test types in Table 4.11 were those at the beginning of unemployment benefit recipiency. As shown in the table, for this cohort, most recipients (97 percent) were subject the job search activity test when entering unemployment benefit program, while less than 2 percent was subject to the incapacity or rehabilitation activity test[18]. Nevertheless, a

[16] The indicator variable, having earned income (*earned income>0),* is actually defined as whether an individual's earned income is greater than or equal to $5 per fortnight. This definition avoids irregularity of reported earned income. The variable, *unearned income>0,* is defined in the same way.

[17] This activity test group includes four activity test codes in the FaCS LDS data set: Claiming DSP (DS/DSP), Incapacitated (IN/INP), Rehabilitation–incapacitated (RI/RHI), and Rehabilitation–nonincapacitated (RN/RHN). Persons with these codes are assumed to have some health problems. In this sample, no one was coded as Claiming DSP or Rehabilitation – incapacitated at the entry of unemployment, 163 were coded as Incapacitated and 2 as Rehabilitation-nonincapacitated. For detailed activity tests codes and definitions, see Appendix 4B.

[18] No one was subject to a DS/DSP activity test at entry into unemployment. This implies that at entry no one had submitted an application for DSP.

much higher proportion of those transferred to DSP were subject to the incapacity or rehabilitation activity test than the other two groups.

4.3.2. Model estimation results

The estimation results are presented in Table 4.12.

Due to the high degree of non-linearity of the MLG model, the interpretation of the coefficients is not straightforward, but the sign of a coefficient indicates the direction of change of the odds ratio (defined as the ratio of the probability of ending in one destination relative to another), given a small change in the explanatory variable when all other explanatory variables are kept constant[19]. The estimated results show the following variables are important in determining the probability of transition to DSP relative to the probability of other destinations: age at entry into unemployment benefit, marital status, whether or not having earned income, the amount of earned income, activity test types, and the duration on unemployment benefit.

The entry age variable enters the model estimation at the 5-year interval. The sign on the entry age variable is negative in both equations, implying that an increase in the age on entering into unemployment benefit raises the probability of transition to DSP relative to another destination, when all other variables are constant[20]. The nonlinear impact of entry age on the log odds ratio is not confirmed, however, because the square of the entry age variable is insignificant in both equations.

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[19] See Appendix 4C for the interpretation of the coefficients of the multinomial logit model.

[20] The marginal effects on the odds ratio can also be calculated for specific values of the explanatory variables (See Table 4.A3 in Appendix 4A). The magnitude and significance of the marginal effect for each variable are sensitive to different choices of the values of explanatory variables.

Table 4.12: MLG model estimation results for transition from unemployment to DSP

	(1) $\ln(\frac{P_{Other-payments}}{P_{DSP}})$		(2) $\ln(\frac{P_{Exit-all}}{P_{DSP}})$	
	Coef.	*Std.err*	Coef.	*Std.err*
Demographic variables				
Age at entry into unemployment /5^	-0.6918***	0.1626	-0.5194***	0.1428
Age at entry /5--squared	0.0172	0.0114	0.0058	0.0098
Sex (male=1)	-1.7331***	0.1180	0.1703	0.1073
Marital status (single=1)	-0.8087***	0.1484	-0.2988**	0.1349
Country of birth (foreign=1)	0.1425	0.1228	0.2098*	0.1092
No. of children	0.2486***	0.0883	-0.0267	0.0833
Age of youngest child	0.0358	0.0248	0.0271	0.0225
Home ownership and rental arrangement				
Home owner (non-homeowner=1)	0.1084	0.1808	-0.0294	0.1567
Rent type (free rent=1)	-0.0919	0.1886	0.2406	0.1715
Rent type (Gov't rent=1)	-0.3970	0.2449	-0.9679***	0.2275
Rent type (private rent=1)	0.0729	0.1435	-0.0618	0.1288
Financial variables				
Earned income>0	0.3192**	0.1372	1.0155***	0.1240
Amount of earned income/100	0.2691***	0.0783	0.3801***	0.0742
Unearned income>0	-0.1539	0.1657	0.0245	0.1440
Amount of unearned income/100	-0.0010	0.0951	-0.0240	0.0828
Activity test types				
Incapacity and rehabilitation	-1.3811***	0.4993	-2.0888***	0.4466
Job search	-0.0230	0.4414	0.0300	0.3992
Duration on unemployment	-0.0271***	0.0067	-0.0470***	0.0060
Square of duration	0.0001**	0.0001	0.0003***	0.0001
Age 50 and over*duration	0.0057	0.0117	-0.0202**	0.0096
Age 50 and over*duration squared	0.0000	0.0001	0.0002**	0.0001
Constant	6.5635***	0.7344	6.2450***	0.6573
Summary statistics of model specification				
Number of observations	*8582*			
LR test	2239.10			
Log likelihood	*-4912.67*			
Pseudo R-squared	0.1856			

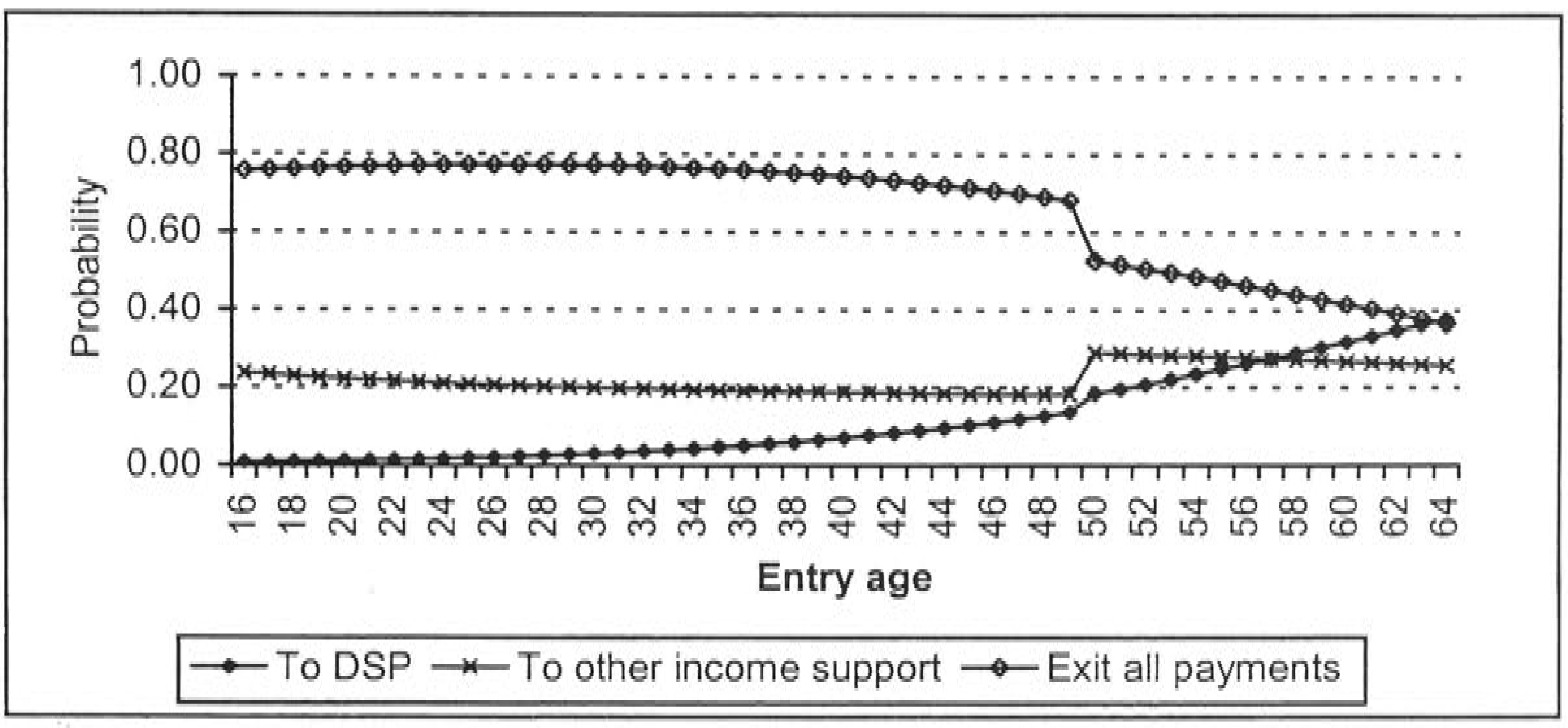
Note: ^Age entered the model at 5 year interval.

*** Significant at 1 percent level, ** 5 percent level, * at 10 percent level.

To illustrate the impact of unemployment entry age on the probability of a particular exit route on leaving unemployment benefit, Figure 4.1 presents the predicted probability of exiting to different destinations by entry age. The values of all the other variables are kept at the sample means. The noticeable break in the curves from age 49 to 50 is because of the inclusion of an interaction variable (between the older age indicator variable, defined as aged 50 and over, and the unemployment duration variable).

The probability of transition to DSP increases with entry age and becomes higher for older ages. For unemployed persons aged over 50 years the probability of transition to DSP is 20 percent or more. For the unemployed younger than 50 years of age the probability of exiting unemployment without transition to other income support payments is dominant, but after 50 years of age the probability of transition to DSP and other income support payments become dominant.

Figure 4.1: Predicted probability of exiting unemployment to different destinations by entry age



The gender variable is significant in equation (1) with a negative sign, implying that, being male increases the probability of transition to DSP relative to transfer to other income support payments. This is understandable, given that there are more income support payments available to females than to males and that transition to sole parent benefits is particularly important for females. Although the gender variable has the expected sign in equation (2) (i.e. being male increases the probability of exit all payments relative to transition to DSP), it is not significant.

The marital status variable is significant in both equations with a negative sign, implying that, being single increases the probability of transition to DSP relative to another destination, keeping all other variables constant. The reason that single persons tend to transfer to DSP, relative to other income support payments, may be that they are less likely to be eligible for family related income support payments than married couples. The reason that single persons are less likely to leave all payments relative to transition to DSP may be that single persons have less incentive to earn more income because they do not need to support a family. In addition, given the relative older age of those who transferred to DSP, being single may be an indicator of lack of success in the labor market which may result from some kind of disability. That is marriage market outcomes and labour market outcomes could be related.

For the home ownership and rental arrangement variables, only the government rental variable is strongly significant in equation (2) but not significant in equation (1), indicating that government rental increases the probability of transition to DSP relative to transfer to other income support payments or exiting all payments.

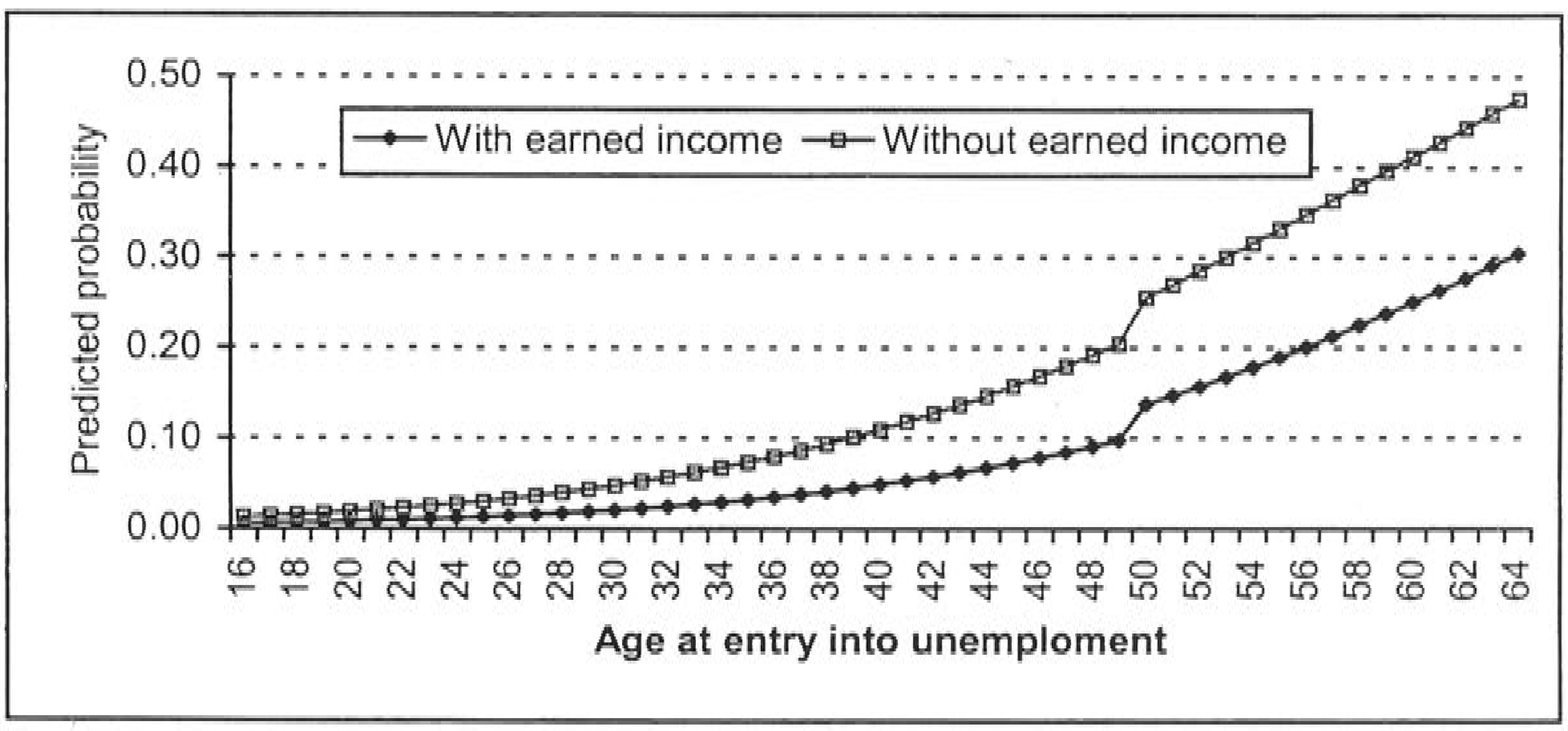
As expected, having earned income, and the amount of earned income, are significant and have the expected sign in both equations. The amount of earned income enters the model estimation in the unit of $100. The signs of these two variables imply that having earned income and an increase in the amount of earned income reduce the probability of transition to DSP, relative to another destination. Having earned income and increases in earned income indicate that the person has an ability to work for earned income, which must reduce the probability of obtaining DSP benefit given the nature of this benefit. In addition, for those who have ability to work the opportunity costs of transition to DSP are high. This reduces the willingness of this kind of person to transfer to DSP.

To give a better sense of the impact of having earned income on the probability of transition to DSP, Figure 4.2 compares the predicted probability of transition to DSP between those with and without earned income, keeping all other variables (except for entry age) at their means. For the very young unemployed, the probability of transition to DSP is low and the difference of the probability of transition between those having earned income and those not having earned income is small. However, this difference increases with the entry age of the unemployed.

Having or not having unearned income and the amount of unearned income are not significant in any equation.

The variable, incapacity or rehabilitation activity test, is strongly significant in both equations. The sign of this variable indicates that being subject to the incapacity or rehabilitation activity test increases the probability of transition to DSP, relative to other exit routes. This is not surprising given the presumption, when constructing this variable, that this activity test type probably indicates some kind of incapacity or health problem.

Figure 4.2: Predicted probability of transition to DSP from unemployment, with and without earned income

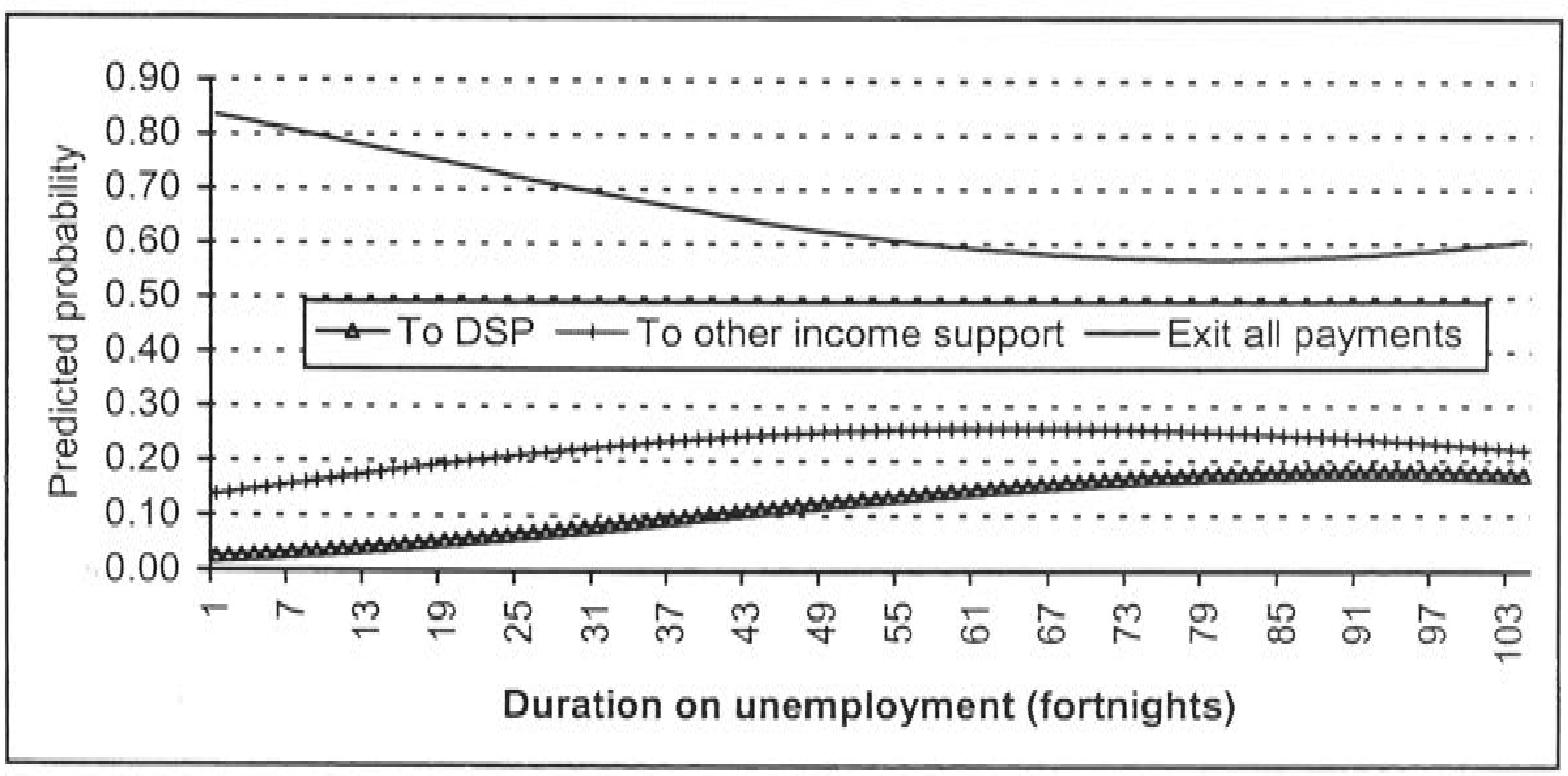


Unemployment duration and its square are included to capture the nonlinear impact of this variable. The unemployment duration variable is strongly significant in both equations, as is its square (but with opposite sign), confirming the correctness of including the square of this variable. An increase in the duration on unemployment benefit itself increases the probability of transition to DSP relative to another destination.

Figure 4.3 presents the predicted probabilities of transition to each destination by unemployment duration[21]. The predicted probability of transition to DSP increases with unemployment duration up to 91 fortnights (3.5 years) and then decreases. The concavity of the probability of transition to DSP with respect to unemployment duration may imply that, although existing disability may become worse with increases in unemployment duration, if the unemployed person has no disability at all, he/she has little chance to be eligible for DSP and for this person the longer on unemployment the less likely a transfer to DSP.

Also note that the average duration on unemployment benefit of this sample is 34 fortnights. This is 37 percent of 91, the duration where the impact of unemployment duration turns around. Therefore, for most of the unemployed, the unemployment duration variable might have only a positive impact on the transition to DSP.

Figure 4.3: Predicted probability of exiting unemployment to different destinations by unemployment duration



[21] In the prediction, for all variables except duration on unemployment benefit, the means of the group who transferred to DSP are used.

The significance of the unemployment duration variable on the probability of transition to DSP provides further support for the relationship between unemployment and DSP as noted in Chapter 3. It also indirectly rejects the argument that the unemployment benefit is a 'hold-on' benefit for those who transferred to DSP from unemployment, since if it were true, we should expect that the unemployment duration would have no impact on the probability of leaving unemployment to a particular destination relative to another.

An interaction variable between the older age indicator variable, defined as 50 years and over, and the unemployment duration is included to test the assumption that duration on unemployment has a significant impact on the transition to DSP for the older unemployed. Because the impact of the duration variable is not linear, an interaction between the older age indicator variable and the square of unemployment duration is also included. Both variables are only significant in equation (2). The significance and the negative sign of the first interaction variable confirm the assumption, but again the impact of duration is not linear for the older unemployed.

4.4. Conclusion

Examinations of the FaCS administrative LDS data show that a majority of DSP inflows were from other income support payment recipients and most of them were former unemployment benefit recipients. Over the period between 1995-96 and 1999-2000, among those who transferred from unemployment to DSP, about 40 percent were over 50 years of age and about one third were aged 51-60. For the 1995-96 unemployment cohort, 20 percent of those aged 51-60 transferred to DSP before 16 June 2000.

Descriptive analysis of the pre-transition experiences of those who transferred from unemployment to DSP shows that for a large proportion of those who transferred from unemployment to DSP, it is unlikely the unemployment benefit is a 'hold on' benefit in the sense that it is only used for the time when their applications for DSP are being processed.

For those who made a transition from unemployment to DSP, not only did 50 to 70 percent have more than one income support recipiency spell prior to the transition, but they also spent more than one year on unemployment benefit. This duration is very long relative to the normal time needed for application processing. Multi-spells and long duration on unemployment benefit prior to the transition may suggest that for these persons either their disabilities were not so bad at the time of becoming unemployed and hence they were not be eligible for DSP or, if they were eligible, they tended not to go to DSP immediately following unemployment.

A multinomial logit model is applied to the 1995-96 unemployment cohort to identify the factors that determine the probability of transition to DSP relative to another destination on leaving unemployment benefit. The estimated results show the following factors are important: age at entry into unemployment benefit, marital status, having earned income, the amount of earned income, activity test types, and duration on unemployment benefit. The entry age variable shows that other things being equal, the older the person at the time of becoming unemployed the higher the probability of transition to DSP relative another exit destination. For an individual, older age means smaller opportunity costs of going to DSP compared with work and then a higher probability of applying for DSP, but whether the application is granted depends on the administrative authority. The significance of the entry age variable here may imply that older age also indicates something to the administrative authority, such as disability or an individual's inability to work.

The significance of unemployment duration on the transition probability lends further support to the proposal that there is a close relationship between unemployment and DSP inflows. The following possibilities may provide an explanation for the link between unemployment and DSP inflows:

(a) Individual health conditions deteriorate with unemployment duration. This eventually makes the individual more likely to be eligible for DSP[22]. There is

[22] Theory suggests that, even though individual health conditions do not deteriorate with unemployment, it is more likely for a person to apply for DSP during unemployment than when the person is employed since the opportunity cost of applying is low when unemployed (Autor, 2001, Autor and Duggan, 2001).

some suggestive evidence for this from the data. Among the 1995-96 unemployment cohort who left unemployment, the proportion subject to *incapacity or rehabilitation* activity tests was greater at the time of exit from unemployment benefit than at entry into unemployment, especially for those who transferred to DSP, as shown in Table 4.13.

(b) Long-term unemployment indicates an individual's inability to work, which leads to the program administrator believing that the individual is eligible for DSP, or

(c) Both (a) and (b) are true.

Table 4.13: Proportion of 1995-96 unemployment cohort subject to different activity tests – only those who left unemployment

	At entry into unemployment			At exit from unemployment		
	Transition to DSP(%)	Transition to others(%)	Exit all (%)	Transition to DSP(%)	Transition to others(%)	Exit all (%)
Incapacity/rehabilitation	12.2	2.3	0.9	52.2	9.6	1.6
Job search	86.4	96.1	98.0	41.7	81.5	90.8
Others	1.4	1.6	1.2	6.1	9.0	7.6

In addition, for the unemployed persons the longer the duration on unemployment the lower the probability of leaving unemployment to take up work, even without health deterioration, because their human capital depreciates with unemployment duration. This again reduces the opportunity costs of transition to DSP for the unemployed and increases their willingness to go on the DSP. Whatever the reason, it is clear that unemployment increases the likelihood that people will end up on the DSP. Therefore, to prevent this transition the best option might be to provide these people with employment opportunities.

Appendix 4A

Table 4.A1: Composition of DSP inflows by year and age[23]

Year	Age	Former income support recipients: UB	SKA	SPP	Others	Non former recipients
1995-96	<=30	17.86	31.25	0.89	7.14	42.86
	31-40	25.22	30.43	3.48	17.39	23.48
	41-50	25.27	24.18	2.20	10.99	37.36
	51-60	26.52	17.89	0.64	14.38	40.58
	61 & over	8.11	14.86	0.00	4.05	72.97
	sub total	23.12	22.74	1.38	12.06	40.70
1996-97	<=30	46.55	9.48	1.72	2.59	39.66
	31-40	40.00	15.00	9.00	10.00	26.00
	41-50	47.62	13.10	4.76	10.71	23.81
	51-60	39.24	9.72	1.04	13.54	36.46
	61 & over	32.94	4.71	1.18	4.71	56.47
	sub total	41.61	10.57	3.04	9.78	35.01
1997-98	<=30	46.71	2.40	0.00	7.19	43.71
	31-40	52.85	4.07	2.44	11.38	29.27
	41-50	51.03	6.19	4.64	12.37	25.77
	51-60	38.19	4.08	0.87	11.95	44.90
	61 & over	22.78	2.53	0.00	7.59	67.09
	sub total	43.16	4.08	1.66	10.71	40.40
1998-99	<=30	47.22	2.78	0.69	2.78	46.53
	31-40	61.48	5.74	5.74	9.02	18.03
	41-50	59.70	7.46	1.99	6.47	24.38
	51-60	44.38	2.81	0.31	12.19	40.31
	61 & over	25.93	9.88	0.00	1.23	62.96
	sub total	49.08	4.95	1.50	7.83	36.64
1999-00	<=30	49.24	0.76	0.00	4.55	45.45
	31-40	48.84	3.10	3.88	12.40	31.78
	41-50	55.00	3.33	1.67	10.56	29.44
	51-60	40.79	4.28	0.33	10.20	44.41
	61 & over	34.18	0.00	0.00	1.27	64.56
	sub total	45.87	2.91	1.09	8.86	41.26

[23] In the table, UB stands for unemployment benefit, SKA sickness benefit, SPP sole parent benefit, and Other, all other income support payments.

Table 4.A2: Transition from unemployment to other income support payments

Year	Age	DSP	SKA	SPP	AGE	Others *
1995-96	<=30	3.49	30.54	19.37		46.60
	31-40	9.86	21.77	20.75		47.62
	41-50	23.83	32.12	6.22		37.82
	51-60	52.20	19.50	1.89	3.77	22.64
	61 & over	5.00	2.50	0.00	90.83	1.67
	sub total	13.74	25.02	13.97	8.59	38.69
1996-97	<=30	10.02	17.25	19.48		53.25
	31-40	15.09	8.68	17.74		58.49
	41-50	39.02	9.27	12.20		39.51
	51-60	49.56	3.95	1.75	7.02	37.72
	61 & over	20.00	0.00	0.00	79.29	0.71
	sub total	22.88	10.46	13.14	9.22	44.30
1997-98	<=30	15.26	13.11	27.01		44.62
	31-40	25.90	5.98	23.11		45.02
	41-50	43.42	4.82	9.65		42.11
	51-60	64.85	3.47	0.00	0.99	30.69
	61 & over	11.46	0.64	0.64	84.71	2.55
	sub total	28.98	7.49	16.23	10.01	37.29
1998-99	<=30	11.72	10.00	29.31		48.97
	31-40	24.19	6.13	20.00		49.68
	41-50	46.51	4.65	8.91		39.92
	51-60	58.20	3.69	0.41		37.70
	61 & over	13.29	0.63	0.00	84.81	1.27
	sub total	27.48	6.39	16.52	8.65	40.97
1999-00	<=30	12.38	3.05	32.76		51.81
	31-40	21.14	2.68	17.79		58.39
	41-50	47.14	3.33	13.81		35.71
	51-60	60.49	1.46	2.44		35.61
	61 & over	18.24	0.00	0.68	77.03	4.05
	sub total	27.27	2.45	18.76	8.23	43.29

* All other income support payments than DSP, SKA, SPP and AGE.

Table 4.A3: Marginal effect estimates of the MLG model

	(1) $\ln(\frac{P_{Other-payments}}{P_{DSP}})$		(2) $\ln(\frac{P_{Exit-all}}{P_{DSP}})$	
	Coef.	***Std.err***	**Coef.**	***Std.err***
Demographic variables				
Age at entry into unemployment	-0.0086**	0.0038	-0.0152***	0.0058
Age at entry --squared	0.0001*	0.0000	0.0000	0.0001
Sex(male=1)	-0.1322**	0.0577	0.0846*	0.0463
Marital status (single=1)	-0.0517**	0.0210	-0.0443	0.0293
Country of birth (foreign=1)	0.0047	0.0074	0.0435*	0.0237
No. of children	0.0189*	0.0103	-0.0129	0.0167
Age of youngest child	0.0016	0.0015	0.0057	0.0045
Home ownership and rental arrangement				
Home owner(non-homeowner=1)	0.0096	0.0106	-0.0110	0.0326
Rent type (free rent=1)	-0.0133	0.0099	0.0578	0.0399
Rent type (Gov't rent=1)	-0.0033	0.0182	-0.2092***	0.0434
Rent type (private rent=1)	0.0068	0.0095	-0.0173	0.0249
Financial variables				
Earned income>0	-0.0046	0.0136	0.2202***	0.0427
Amount of earned income/100	0.0092*	0.0054	0.0777***	0.0187
Unearned income>0	-0.0114	0.0099	0.0088	0.0300
Amount of unearned income/100	0.0007	0.0055	-0.0048	0.0170
Activity test types				
Incapacity and rehabilitation	-0.0440	0.0288	-0.4341***	0.0624
Job search	-0.0013	0.0239	0.0060	0.0810
Duration on unemployment	-0.0007	0.0006	-0.0104***	0.0019
Square of duration	0.0000	0.0000	0.0001***	0.0000
Constant	0.3239***	0.1105	1.1745***	0.1575

Note: 1.*** significant at 1 percent level;** 5 percent level; * 10 percent level.

2. The marginal effect are calculated at the following variable values:
Age(at entry)=45, gender=male, marital status=single, homeowner=non-homeowner, country of birth=foreign, government rent=1, private rent=1, free rent=1, other rent=0, number of kids=2, age of the youngest kid=1, earned income(>0)=1, amount of earned income=157, unearned income(>0)=1, amount of unearned income=59, duration on unemployment=34.02 (fortnights), incapacity or rehabilitation activity test type=1, job search activity test type=1.

Table 4.A4: Summary statistics of the still on (unemployment) group of the 1995-96 unemployment cohort

Number of persons	2871
Duration on unemployment(fortnights)*	85.12 (31.33)
Demographic characteristics	
Male (%)	75.55
Age at entry into unemployment	33.46 (14.15)
Male	34.25 (14.38)
Female	31.03 (13.13)
Marital status_couple(%)	26.26
Australian born (%)	77.6
Proportion having children (%)	11.18
Number of children	2.12 (1.13)
Age of the youngest child	5.40 (4.24)
Home ownership and rent type	
Home owner (%)	17.55
Government rent (%)	4.56
Private rent (%)	35.42
Free rent (%)	17.14
Other rent (%)	42.88
Financial variables	
Earned income>0 (%)	53.61
Average earned income/100***	0.89 (1.22)
Unearned income>0	14.7
Average unearned income/100*	0.66 (1.60)
Activity test type at entry	
Incapacity or rehabilitation****(%)	1.57
Job search (%)	95.68
Others (%)	2.75

Note: * Duration on unemployment over the observable period, not duration on the last unemployment spell.

** Standard deviations are in parentheses.

*** Average earned and unearned income for those who have them.

****Activity test requirement at the time of entering into unemployment benefit.

Appendix 4B

Activity test status - code and definition in the LDS data*

Code	Definition
Blank/"-"	unknown
AM	Adult migrant education.
ED	Approved full-time education.
BP	Bereavement payment.
EC	Caring responsibilities.
CS	Community service order.
DS	Disability support claim pending.
EM	Expentant mother.
FT	Formal training.
GO	Group co-operative.
IN	Incapacitated.
RI	Incapacitated, rehabilitation.
JS	Job search.
JD	Jury duty.
AL	Literacy course.
EP	Major personal crisis.
EH	Major personal discruption.
RN	Rehabilitation, nonincapacitated.
PW	Part-time work.
ER	Refugee, first 6 months.
RA	Remote activity.
RL	Remote location.
SE	Self-employment.
SC	Short course.
VA	Voluntary work activity agreement.
VE	Voluntary work plus employment.
VW	Voluntary work.
WC	Compulsory work for the dole.
WN	Non-compulsory work for the dole.
YA	Youth activities.
ALC	Adult literacy course.
AME	Adult migrant education.
ARM	Armed services training camp (oversea only).
AUS	AUSTUDY/ABSTUDY (first 3 wks).
BVP	Bereavement period.
CAR	Caring responsibilities.
CRS	Commonwealth Rehab Services.
CSO	Community Service Order.
CSP	Community support program.
DOE	Disability Open Employment.
DSE	Disability Supported Employment.
DSP	Claiming DSP.
EXM	Expectant Mother
EXP	Expectant Mother (replaced by EXM - March 2000)
FL2	Flex 2.
FL3	Flex 3.
FTA	Formal training.
FTS	Full time student.
GRO	Group/community cooperative exercise.
INA	Intensive Assistance.
INP	Incapacitated.

Code	Definition
JFT	JET Funded Training.
JSE	JOB Search.
JST	JOB Search Training.
JUR	Jury Duty.
MCU	MO -Combination of Part-time work, Voluntary Work and Education & Training.
MET	MO - Education and Training (6 hours cours contact per week).
MFV	Approved full-time voluntary work.
MJP	Job placement, education and training.
MLN	Literacy/Numeracy.
ML2	Mutual Obligation(MO) - Job Search Training.
MPC	Major personal crisis.
MPD	Major personal discruption at home.
MPT	MO-part-time work (at least 12 hours per fortnight).
MPV	MO-combined part-time and voluntary work (must be at least 12 hours per fortnight).
MRE	MO-relocation to improve employment prospects.
MVW	MO voluntary work (must be at least 12 hours per fortnight).
NEI	Newstart Enterprise Incentive Scheme.
PTW	Part-time work.
REF	Refugee - first 13 weeks in Australia.
RHI	Rehabilitation - incapacitated.
RHN	Rehabilitation - non-incapacitated.
RLC	Remote location.
R6M	Refugee-first 6 months in Australia.
SED	Pre NEIS training.
SEP	Development of self-employment.
SHC	Short course.
VPE	Voluntary and paid work (combined).
VWA	Voluntary work (activity agreement).
VWK	Voluntary work.
WCP	Work for the Dole-compulsory participant.
WVP	Work for the Dole-voluntary participant (replace by new code WED-March 2000)
YAC	Youth activities.
LIT	Literacy & Numeracy Training-Non-Mutual Obligation customer
NAA	New Apprenticeship Access program.
AEM	Advanced English fro migrants.
JPP	Jobs Pathway Program.
CDP	CDEP Participant.
DBS	Disability Biusiness Services.
JPE	JPET.
MDF	Army Reserve.
PEA	Precluding earnings from employment.
PHR	Precluding hours from employment.
REM	Remote activity.
WFD	Work for the Dole-voluntary participant (replaces old code WVP)
ZZZ	No activity recorded.

Note: (1). Two character codes were used prior to May 1998; and three character codes were used post May 1998.

(2). This appendix is drawn from "**LDS 1% Sample User Documentation**", Information Strategies Branch at FaCS, Version 1.5, April 2001.

Appendix 4C

The multinomial logit model (MLG) and interpretation of the coefficients

The empirical model[24,25]

Suppose for an unemployed person i, the probability of exiting to a specific destination j, P_{ij}, is a function of the individual characteristics and other factors, X_i,

$$P_{ij} = P\{X_i; \beta_j\}. \tag{4.a1}$$

Where β_j is a vector of parameters.

In the MLG model, $P\{.\}$ takes the form of a logit probability function. Then, for a particular exit destination, in terms of the probability, the generalized logit model is defined by

$$P_{ij} = \frac{\exp(\beta_j' X_i)}{\sum_{l=1}^{J} \exp(\beta_l' X_i)} \quad \text{for } j = 1,.., J \tag{4.a2}$$

Where P_{ij} is the probability of individual i exiting unemployment by going to destination j. J is the number of unordered alternative exit destinations; β_j is a vector of unknown parameters associated with the probability of exiting to the j^{th} alternative.

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[24] This section is drawn from Greene (1993), Agresti (1990), Hoffman and Duncan (1988), Long (1987) and Robins and Dickinson (1985).

[25] There is a distinction between the multinomial logit (MLG) model and the conditional logit (CLG) model in the literature. The MLG model focuses on the individual as the unit of analysis and uses the individual's characteristics as explanatory variables; the CLG model (some times called McFadden's CLG model) focuses on the set of alternatives for each individual and the explanatory variables are characteristics of those alternatives. According to Hoffman and Duncan (1988), the MLG model provides better direct and useful information about which individuals make which choices, whereas the CLG model is more suitable for testing hypotheses about why those choices are made.

The parameters of this model (β_j) are not uniquely identified in the sense that there is more than one solution to the set of the parameters that lead to the same probabilities for the alternatives. This can be seen by multiplying equation (4.a1) by $\exp(q'X_i) / \exp(q'X_i)$, where q is an arbitrary non-zero vector as

$$P_{ij} = \frac{\exp(\beta_j' X_i)}{\sum_{l=1}^{J} \exp(\beta_l' X_i)} = \frac{\exp[(\beta_j + q)' X_i]}{\sum \exp[(\beta_l + q)' X_i]} \quad \text{for } j = 1,.., J \tag{4.a3}$$

As a consequence, the resulting value of the probability (P_{ij}) is unchanged, but the logit parameters are changed. In other words, the sets of parameters, β_j and $(\beta_j + q)$, are equally solutions to the model; that is, the vector of the parameters defined by equation (4.a1) is not uniquely identified. For identifiability, an additional constraint is imposed on the parameter vector β_j in the form of a normalization rule. One convenient normalization is to assume that all parameters associated with one alternative destination are equal to zero. Suppose β_1 is equal to zero, the MLG specification can be rewritten as

$$P_{i1} = \frac{1}{\sum_{l=1}^{J} \exp(\beta_l' X_i)} \quad \text{for } j = 1 \tag{4.a4}$$

and

$$P_{ij} = \frac{\exp(\beta_j' X_i)}{\sum_{l=1}^{J} \exp(\beta_l' X_i)} \quad \text{for } j = 2,..., J. \tag{4.a5}$$

The model, then, implies that $(J-1)$ log-odds ratios can be computed as

$$\ln(\frac{P_{ij}}{P_{i1}}) = \beta_j' X_i \quad \text{for} \quad j = 2,\ldots,J \tag{4.a6}$$

Where β_j is understood as the difference between the two sets of logit coefficients, β_j and β_1, in which one of the two sets of the coefficients, β_1 is normalized to be zero. It is worth noting that the choice of normalization is completely arbitrary and has no impact on the empirical results in the sense that the choice does not affect the predicted probabilities for the alternatives, although the coefficients would differ because they have different interpretations.

The method of maximum likelihood is applied to estimate the $(J-1)$ non-redundant logit equations defined by equation (4.a6) to obtain a set of $(J-1)$ coefficients, β_j, for each explanatory variable. As a result of the estimation method, the parameter estimates are consistent and have large-sample normal distributions with asymptotic standard errors obtained from the inverse of the information matrix.

Interpretation of the coefficients in the MLG model

Because of the highly non-linear functional form of the generalised logit model, the interpretation of the estimated coefficients is not straightforward. The first-order partial derivative of the logit equation (4.a6) for variable X_k gives

$$\frac{\partial \ln(P_j / P_1)}{\partial X_k} = \beta_{kj} \quad \text{for} \quad j = 2,\ldots,J \tag{4.a7}$$

For variables in quadratic form such as the square of entry age in the estimated model, the first-order partial derivative of the logit equation (4.a6) not only depends on its coefficient but also depends on the values of the variables at which the derivative is computed as seen by

$$\frac{\partial \ln(P_j/P_1)}{\partial X_k} = \beta_{kj} + 2\beta_{k2j}X_k \text{ for } j = 2,...,J \quad (4.a8)$$

where β_{k1j} and β_{k2j} are the coefficients of the linear and squared term of the variable X_k.

The first-order derivative is then interpreted as a change in the logarithm of the odds-ratio, not in the odds-ratio itself and, of course, not linearly related to the probability, given a one unit change in variable X_k controlling for all other predictors in the model. The signs of the coefficients, hence, are not sufficient to determine the direction of change of the corresponding probabilities as the exogenous variable changes, given all other variable being constant. To see how the corresponding probability of the outcome (j) changes given one unit change in variable X_k controlling for all other variables in the model, we take the first-order partial derivative of P_j from equations (4.a4) and (4.a5) with respect to variable X_k. For variables in linear forms, that is

$$\frac{\partial P_j}{\partial X_k} = P_j(\beta_{kj} - \sum_{l=1}^{J} P_l \beta_{kl}) \text{ for } j = 2,...,J \quad (4.a9)$$

all notations are the same and $\beta_{(.)1}$ was normalized to be zero as before. Obviously, given one unit change in the variable X_k, the change in the probability of the outcome (j) not only depends on the coefficient of the variable X_k in the logit equation (j), but also depends on the rest of the coefficients of the variables in the model as well as the probabilities of all outcomes. Those, in turn, depend on the coefficients of all variables in the model and certain values of these variables according to equation (4.a4) and (4.a5), and a further effect of the values of the variable X_k (in the case of quadratic form) at which the derivative is computed.

Fortunately, a function in logarithmic form, ln(.), is an increasing function of its arguments. Thus the signs of the coefficients in the logit equation (5.a6) could be used to determine the direction of the change in the odds ratio for a small change in the exogenous variable, holding the other variables constant. (The odds ratio is defined as the ratio of the probability of one alternative to another). For example, a negative sign of the coefficient for entry age variable in the estimation equation (1) in Table 4.15 implies that an five-year increase in entry age will decrease relatively the probability of observing someone transferring to other income support payments rather than transition to DSP, controlling for other variables. This happen despite the fact that both probabilities may rise, as long as probability of transferring to other income support payments rises by less than the probability of transition to DSP, or both may fall, as long as the former falls by more than the latter.

Chapter 5

Determinants of Duration on DSP— An Application of the Duration Model

5.1. Introduction

Duration on social welfare benefits is of great interest to both academia and policy makers because the number of recipients is determined by duration as well as inflows. For an individual recipient, the longer the person stays on a benefit, the larger the cost to the program. Therefore, an understanding of the determination of completed DSP duration is important.

In addition, there is concern that welfare recipients may experience duration dependence. For most welfare programs the longer a person is on a benefit the lower the probability that they will leave. Duration dependence is the term used when this relationship is causal. The concern about duration dependence has led many OECD countries to put considerable effort into developing programs to encourage transition from welfare to work.

Duration models have a history of extensive implementation in economics and related areas[1]. The most thoroughly studied area using these models in economics is perhaps the duration of unemployment, where factors that may impact on the transition from unemployment to work (or other states) have been examined, including the duration of unemployment itself since it may play a critical role in individual reservation wage formation (Devine and Kiefer, 1991). As for the application of duration models to welfare benefit recipiency, one area, which has been subject to scrutiny, is the AFDC

[1] Duration studies include length of marriage (Lillard, 1993), length of time until return migration (Lindstrom, 1996), length of time in employment (Keane and Wolpin, 1995), length of time until childbirth (Heckman and Walker, 1990), length of strike (Kennan, 1985), length of time until a purchase (Jain and Vilcassim, 1997) and length of business cycles (Diebold and Rudebush, 1990).

(Aid to Families with Dependent Children) benefit in the US, where the determinants of length of stay on the program and duration dependency have been extensively examined (Blank, 1989; O'Neill, Bassi and Wolf, 1987).

The application of duration models to disability benefit programs is very limited. There appear to be only two known studies: Hennessey and Dykacz (1989) and Holmes and Lynch (1990). Hennessey and Dykacz applied a competing risk duration model to a random sample of Social Security disability beneficiaries in the US who were first entitled to disabled-worker benefits in 1972. Their study estimated the coefficients of the factors that determined the probability of leaving the benefit and used these coefficients to project the expected outcomes and expected length of stay of program recipients. The Holmes and Lynch's study examined the factors that impacted on duration of Invalid Benefit (IVB) recipiency for males in Britain.

The main reason for the few studies in this area may be the lack of available data. Duration on a disability benefit program is normally very long compared with other benefit programs, such as unemployment or sickness benefits. Consequently, not only is longitudinal data required, but also the required period of data is generally very long.

The FaCS LDS data is most suitable for the study of disability benefit duration, although a longer data period would of course be better. Barrett (2000) used this data set to examine the dynamics of sole parent pension recipients in Australia, employing duration analysis techniques and it is a natural extension to apply these techniques to DSP recipients. Dawkins, Harris and Loundes (2000) also used this data set to examine the distribution of spells of DSP recipients, but they did not look at the determinants of the duration of DSP spells. This chapter attempts to fill this gap and provide estimates of the expected completed duration on DSP, which is the main theme of the next chapter.

The application of the duration model in labour economics, such as the studies on the duration of unemployment and other benefit payments, is often motivated by a model of individual choice in the context of utility maximization. A stylized model for duration on welfare program is as follows. Assume, at a point of time, for a person already on the program, that there are two options (or states): continue to stay on the program, or leave the program to work. Both options are associated with state specific utilities or option values and the individual makes a decision by comparing the two state specific utilities. If the expected utility associated with continuing to stay on the program is greater than that of leaving (to work), the individual will continue to stay, otherwise the person will leave to work[2]. The utility or option value of staying on the program will be a function of personal characteristics, the level of the program payment and the length of the current duration on the program[3]. Similarly, the utility of leaving for work will be a function of the availability of jobs and the value of the wage and personal characteristics. Therefore, all the factors that tend to enhance the expected utility of working (e.g. an increase in the wage rate) and to reduce the expected utility of staying (e.g. a decrease in the benefit level) will encourage the person to leave and increase the hazard rate from receiving the benefit.

Although the analysis of the duration on DSP can be put in the same framework as described above, it is difficult to derive a theoretical model to directly apply to the data currently available. The reason is that some of the options or states outside of benefit recipiency may not be based on individual choice. They cannot be modelled as an individual option. For example, death is an exit that is not normally chosen. In this chapter these complications are set aside and the assumption is that there are only two states for a DSP recipient to choose from, stay on DSP benefit or exit (due to whatever reason[4]).

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[2] The framework of analysis is similar to the stylized search model in the unemployment duration literature.

[3] The length of the current duration may directly affect an individual's utility if participation in the program alters an individual's income-leisure trade-off or changes the nonmonetary 'stigma' costs of participation. These effects may be further sources of state dependence in the program participation.

[4] An attempt has been made to model terminations due to death and cancellation separately using a competing risk duration model. This needs to combine the LDS data with a data set containing termination reasons. As will be described in Chapter 7, using the termination reason information will reduce the sample to a very limited period window. In this case, if only fresh spells are used as is a common practice in the literature, then the longest duration of the fresh spells will be only about one year. This is obviously not appropriate given that the duration of DSP recipiency is normally very long. Using all the spells rather than only the fresh spells (this means to include the left-censored spells) to compensate for this problem has been tried. However, the empirical survival function of the

This chapter is organized as follows: in the next section the empirical model is briefly discussed to provide some background knowledge of the duration model. Section 3 describes the data. The estimation strategy and the empirical results are presented and discussed in section 4. Section 5 sets out the conclusions.

5.2. The empirical model[5]

The starting point in modelling duration data is the estimation of a hazard function, which measures the instantaneous tendency of a given event (termination of DSP recipiency in the context of this chapter) to occur at each point in time. Let $F(t, X(t))$ represent the (cumulative) distribution function of duration spent on the program, the probability of staying on the program for no longer than time t. $X(t)$ is a vector of explanatory variables, some of which may be time-dependent (such as the unemployment rate variable included in the later model estimation). Let $S(t, X(t)) = 1 - F(t, X(t))$ be the survival function, the probability of staying on the program for at least time t, or the percent surviving (still on the program) at time t. The hazard function, $h(t, X(t))$, is defined as the instantaneous rate of leaving the program at $T = t$, conditional upon surviving up to time t,

$$h(t, X(t)) = \lim_{\delta t \to 0} \frac{P(t \le T < t + \delta t \mid T \ge t, X(t))}{\delta t}. \quad (5.1)$$

Note that the hazard function provides no more information than the distribution function or the density function. Since

sample selected in this way is very different from the one consisting of only the fresh spells within the five-year period covered by the LDS data. Specifically, the survival function of the former is significantly biased up due to the left-censored spells. As a result, the attempt to apply a competing risk model is given up. However, when more data become available, it will be better to treat death and cancellation (or even recovery) as separate exit destination in modelling since it should be expected that death and cancellation would follow quite different processes.

[5] This section draws on Blank (1989) and Hennessey and Dykacz (1989). For a detailed description on the application of the duration model in the economics duration data, see Kiefer (1988) and Heckman and Singer (1985).

$$h(t, X(t)) = \lim_{\delta t \to 0} \frac{P(t \le T < t + \delta t \mid T \ge t, X(t))}{\delta t}$$

$$= \frac{\lim_{\delta t \to 0} \{[P(t \le T < t + \delta t \mid X(t)] / \delta t\}}{S(t, X(t))}$$

$$= \frac{f(t, X(t))}{S(t, X(t))}$$

$$= -d \ln(S(t, X(t)) / dt \tag{5.2}$$

where $f(t, X(t))$ is the density function associated with $F(t, X(t))$.

Integrating the last equation of (5.2), we get:

$$S(t, X(t)) = \exp(- \int_0^t h(s, X(s)) \, ds) \tag{5.3}$$

Then,

$$F(t, X(t)) = 1 - S(t, X(t))$$

$$= 1 - \exp(- \int_0^t h(s, X(s)) \, ds) \tag{5.4}$$

and

$$f(t, X(t)) = dF(t, X(t)) / dt$$

$$= h(t, X(t)) \exp(- \int_0^t h(s, X(s)) \, ds) \tag{5.5}$$

Thus, choosing a hazard function, h, is equivalent to choosing a distribution function for t, and vice versa.

If a spell i is observed to terminate (or be completed) with duration t, it contributes to the likelihood function by $f(t, X_i(t))$. If it is observed as right-censored, its contribution to the likelihood function is $S(t, X_i(t))$ since it survives to t. Then the likelihood function for a sample is:

$$L = \prod_{i=1}^{m_1} f(t_i, X_i(t)) \prod_{j=1}^{m_2} S(t_j, X_j(t)) \tag{5.6}$$

where m_1 are the completed spells, m_2 the right-censored spells, and $m_1+m_2=N$ the total number of spells in the sample.

Taking the logarithm of the likelihood of equation (5.6), and replacing the density and survival functions with their formulas in terms of the hazard function, as shown in equation (5.3) and (5.5), results in:

$$l = \sum_{i}^{N} d_i \ln h(t_i, X_i(t)) - \sum_{i}^{N} \int_0^{t_i} h(s, X_i(s))ds \qquad (5.7)$$

It is left to specify the hazard function to incorporate the impacts of covariates $X(t)$ and this will be done later.

5.3. The data

The sample is selected from the FaCS one percent sample LDS data set and consists of all the fresh spells[6] which start between 3 March 1995 and 30 December 1999 (inclusive)[7].

[6] If multi-spells occurred for a recipient only the first spell is selected. If the second and subsequent spells were to be included in selection, an assumption that these spells behave in the same way as the first spells would need to be made. However, this may not be the case. Another reason for including only the first spells is that the next chapter will estimate the expected completed duration of the first spells of DSP recipients using the estimated parameters in this chapter. Because the focus is on the first spells, left-censored recipients even with reentry spells after the beginning of the data window are excluded. However, the first spells defined here are not the same as those that occurred in the data set. If a person had multi-spells, only the first-at-least two-fortnight spell is treated as the first spell. This is to avoid irregular records. Multi-spells are defined to have at least two fortnights break in benefit recipiency.

[7] The maximum time window of the data is from 6 January 1995 to 16 June 2000. The analysis uses spells that began from 3 March 1995 (inclusive) rather than from 6 January 1995 because this makes it possible to identify where the new recipients come from (i.e. transition from unemployment, transition from other income support payments, or from outside the income support payment system).

Although the durations of the left-censored spells falling into the data period are known, they are excluded from the sample. The reason for this is that including the left-censored spells may lead to sample selection bias (Lancaster, 1990). The left-censored spells are a special subset of spells that are typically long as shown by Heckman and Singer (1984) and their inclusion would form a 'length biased sample'[8].

As right-censored spells can be easily handled in the duration model estimation as shown in equations (5.6) and (5.7), they are included in the sample. However, right-censored spells include two types in this analysis: (i) those spells still continuing at the end of the data set (i.e., 16 June 2000); and (ii) those spells which end because of a transfer to the Age Pension. For the latter, if recipients did not transfer to the Age Pension they would have still continued their DSP spells at the time of the transition. They are treated therefore as right-censored at the time of transition.

5.3.1. Summary statistics of the data

In total 3658 fresh and first spells appeared in the time period defined above. Of these, 655 were completed spells, i.e. the individual left DSP without transferring to the Age Pension, and there were 3003 right-censored spells[9]. Table 5.1 presents summary statistics of this sample. The values of all variables, except for financial variables, are as at the beginning of the spell. The financial variables, especially the amount of earned and unearned income, are included as individual averages over the DSP recipiency period[10].

[8] In essence, of all the spells that started on a particular day prior to the start of the data period, only those spells that are sufficiently long make it into the data period window. Also see footnote 4, where it is noted that left-censored spells biases upwards the empirical survival function as expected.

[9] The right-censored spells include spells for recipients who transferred to the Age Pension. Summary statistics for these spells are presented in Table 5.A1 in Appendix 5.A.

[10] The reason for using average over individual DSP recipiency period rather than the values at entry or as time-varying variables is that for DSP recipients the records of earned and unearned income appear irregularity because earned and unearned income may not be reported and recorded fortnightly.

Table 5.1: Summary statistics of the sample used for duration model estimation

	All spells	Completed spells	Right-censored spells
Number of persons/spells	3658	655	3003
Average duration (fortnights)	64.86	35.72	71.19
	(39.20)**	(31.34)	(37.85)
Demographic characteristics			
Male (%)	63.15	68.40	62.00
Age at entry	46.51	44.88	46.87
	(13.23)	(12.47)	(13.36)
Male	47.43	45.04	48.01
	(13.67)	(13.21)	(13.72)
Female	44.93	44.51	45.01
	(12.28)	(10.71)	(12.55)
Marital status__couple (%)	46.77	47.33	46.65
Australian born (%)	69.87	74.50	68.86
Proportion having children (%)	14.11	18.47	13.15
Number of children***	1.90	1.88	1.91
	(1.09)	(0.94)	(1.14)
Age of the youngest child***	8.70	8.30	8.82
	(5.25)	(4.95)	(5.33)
Home ownership and rent type			
Home owner (%)	44.67	42.75	45.09
Government rent (%)	8.39	7.33	8.62
Private rent (%)	23.95	27.94	23.08
Free rent (%)	6.72	7.02	6.66
Other rent (%)	60.93	57.71	61.64
Financial variables			
Earned income>0 (%)	11.67	17.86	10.32
Average earned income****	133.16	195.23	109.73
	(166.37)	(216.26)	(136.35)
Unearned income>0 (%)	37.70	31.91	38.96
Average unearned income****	95.55	111.79	92.65
	(149.89)	(179.91)	(143.76)

(Continue)

Table 5.1: Summary statistics of the sample used for duration model estimation (continued)

	All spells	Completed spells	Right-censored spells*
Where coming from			
Transition from			
unemployment benefit (%)	41.63	30.99	43.96
other income support payments (%)	23.26	27.48	22.34
Outside income support system (%)	35.10	41.53	33.70
Proportion by state			
NSW & ACT	34.58	35.27	34.43
NT	0.68	0.92	0.63
QLD	19.49	20.46	19.28
SA	9.19	8.85	9.26
TAS	3.31	2.44	3.50
VIC	24.19	21.98	24.68
WA	8.56	10.08	8.23
Proportion by entry year			
1995	20.86	27.18	19.48
1996	19.33	24.58	18.18
1997	19.35	20.31	19.15
1998	19.33	17.25	19.78
1999	21.13	10.69	23.41

* Including those who transferred to the Age Pension.

** Standard deviations are in parentheses.

*** For those who have children.

**** For those who have earned or unearned income.

Males made up of a higher proportion of the sample than females. Among completed spells, their proportion was even higher. The average entry age of the whole sample was 46.5 years, males being slightly older than females, although the age gap was not statistically significant. Those who completed a spell had younger entry ages on average than right-censored individuals. However, among those who complete a spell there is no significant difference in average age between males and females.

Less than half of the recipients were married and about 70 percent were Australian born. Among completed spells a slightly higher proportion than in the sample as a whole were born in Australia. The proportion of the sample with a child was 14 percent. For the completed spells, this proportion was relatively larger (18 percent). The average number of children for those who had a child (or children) was about 2 and on average the age of the youngest child was about 9 years.

Turning to the home ownership and rental arrangement variables, the proportion of home owners in the whole sample was about 45 percent. Private and other rental accommodations made up most of the sample. About 8 percent lived in accommodation rented from government and another 7 percent lived in free accommodation.

For the financial variables, about 12 percent of the whole sample had earned income. For those who had earned income, the average amount was $133 per fortnight. The completed spells had a higher proportion of recipients (18 percent) who had earned income and they also earned more on average. The proportion having unearned income in the sample was 38 percent and for those who had unearned income the average amount was about $100 per fortnight.

For the whole sample about 42 percent had a previous unemployment experience, 23 percent were from other income support payment programs, and 35 percent were from outside the income support system[11,12].

Table 5.1 also presents the distribution of recipients by state and entry year. The state variables are included in the model to pick up any state fixed effect. The entry year variables are to control for cohort specific effect over the five entry years.

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[11] The composition of recipient sources is slightly different from those shown in Chapter 4 because here a person with multiple entries is only counted as one new recipient, but in Chapter 4 a person could be counted several times according to his/her number of entries.

[12] To compare the differences of recipients from different sources, Table 5.A4 in Appendix 5A presents summary statistics by recipient source.

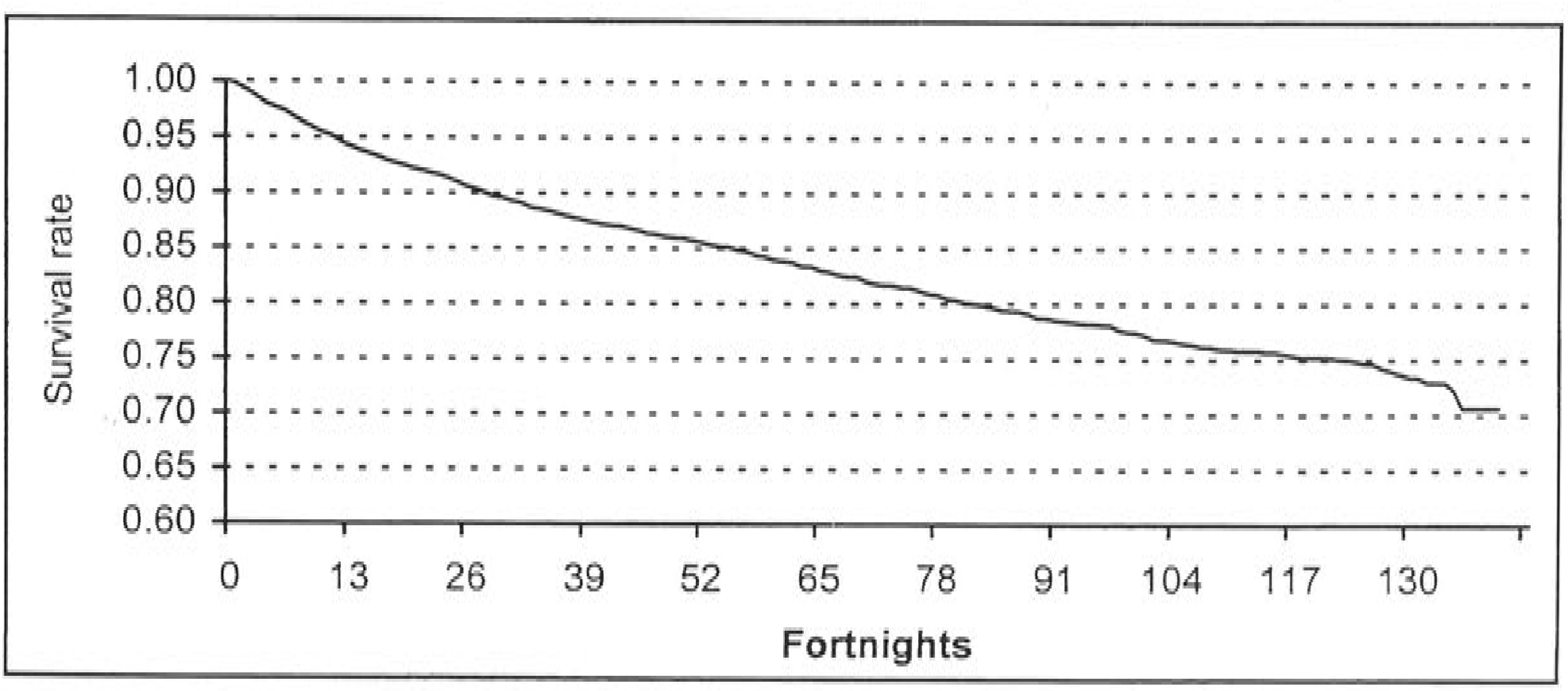
5.3.2. Empirical survival and hazard functions

Figure 5.1a plots the empirical survival function of the whole sample. The survival function shows the proportion of spells that are at least x fortnights long[13].

From the figure, after a half year (13 fortnights) 94 percent of the spells are still continuing. After one year 91 percent are still continuing, at the two-year point 86 percent are continuing and at the five-year point 73 percent. In other words, within a half year less than 6 percent of an entry cohort of DSP recipients left DSP, within one year 9 percent, within two years, 14 percent, and within five years, 27 percent.

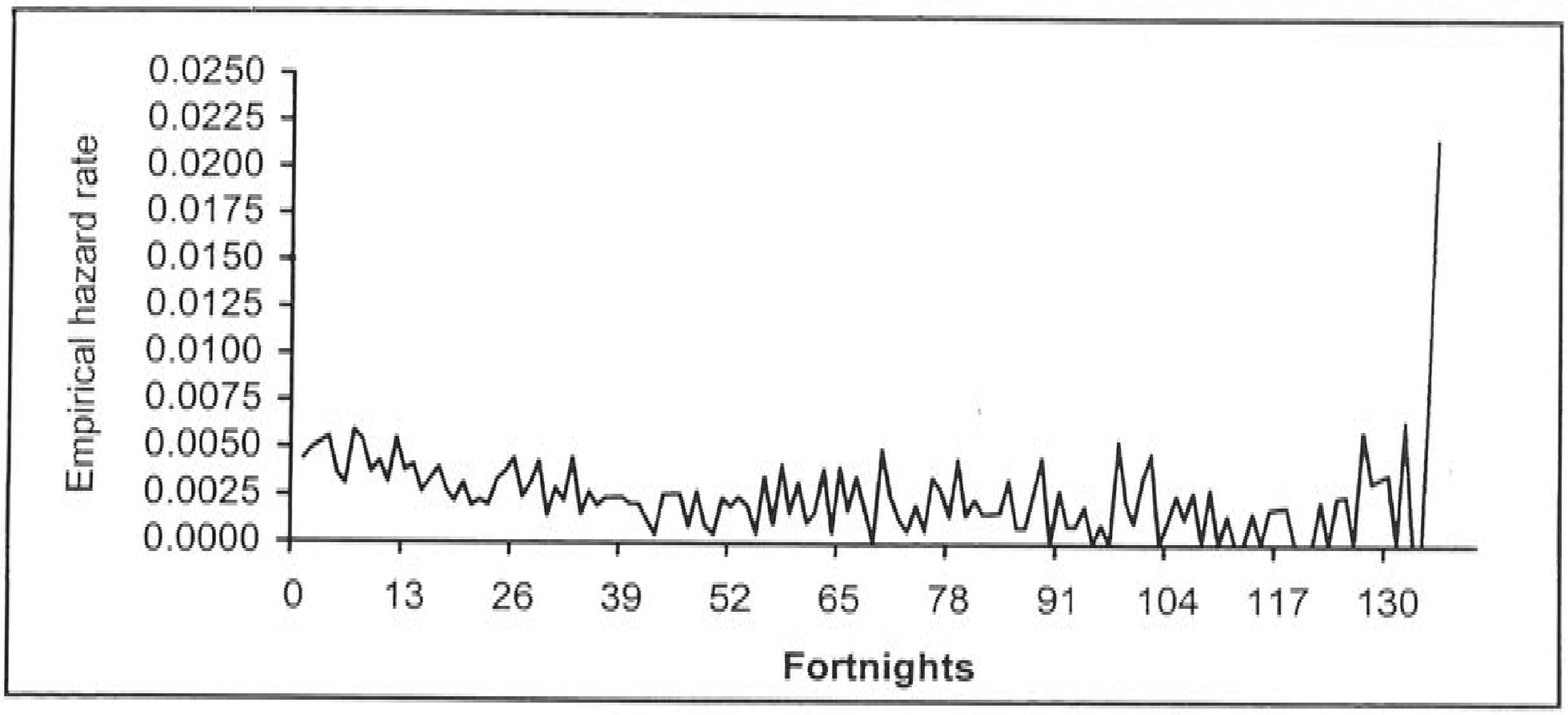
Figure 5.1b plots the empirical hazard function for the whole sample. For duration less than two years (52 fortnights), the empirical hazard rate appears to decline. But at about two-year point the hazard rate starts to increase. This may be because after two years of DSP recipiency there is a review on recipient eligibility and this review moves out those who are no longer eligible. Also note that the variation of the hazard rate after two years duration increases dramatically. The hazard rate for very long durations behaves erratically because only a few spells have such long durations in the sample.

Figure 5.1a: Empirical survival function, the whole sample



[13] The empirical survival function is estimated using the Kaplan-Meier product-limit method (Kaplan and Meier, 1958). For a detailed discussion on this method, see Cox and Oakes (1984) or Pagano and Gauvreau (2000).

Figure 5.1b: Empirical hazard function, the whole sample



The spell sample can be stratified according to one set of characteristics at a time, to obtain a better sense of the relationship between that characteristic and spell duration. The empirical survival and hazard functions for various dimensions of the sample can then be plotted.

Figures 5.2a and 5.2b plot the empirical survival and hazard functions by gender. It is clear that the survival rate for males is lower than for females, implying females stay longer on DSP. The male empirical hazard function is much like the hazard function of the whole sample (remember, males were more than 60 percent in the sample). It also appears that the main difference of the hazard rate between males and females takes place at duration intervals of less than one year and after two and a half years.

Figure 5.2a: Empirical survival function by gender

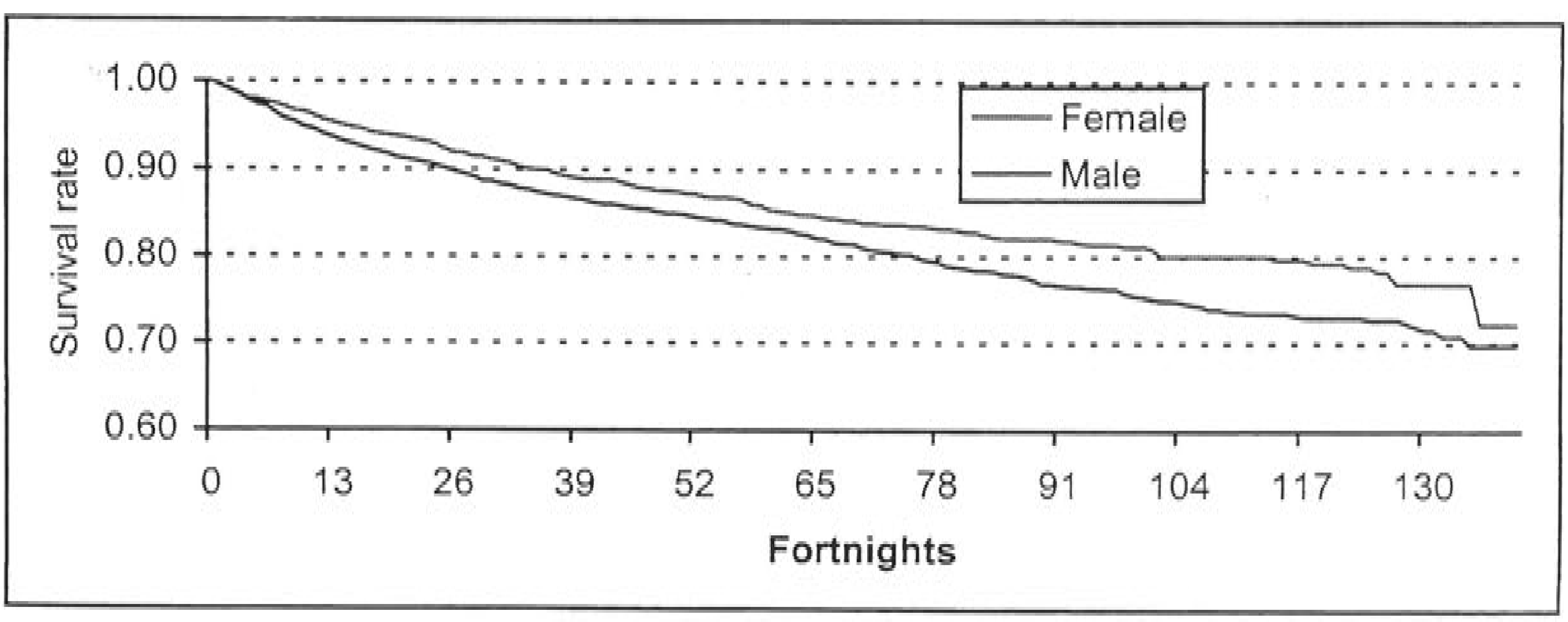
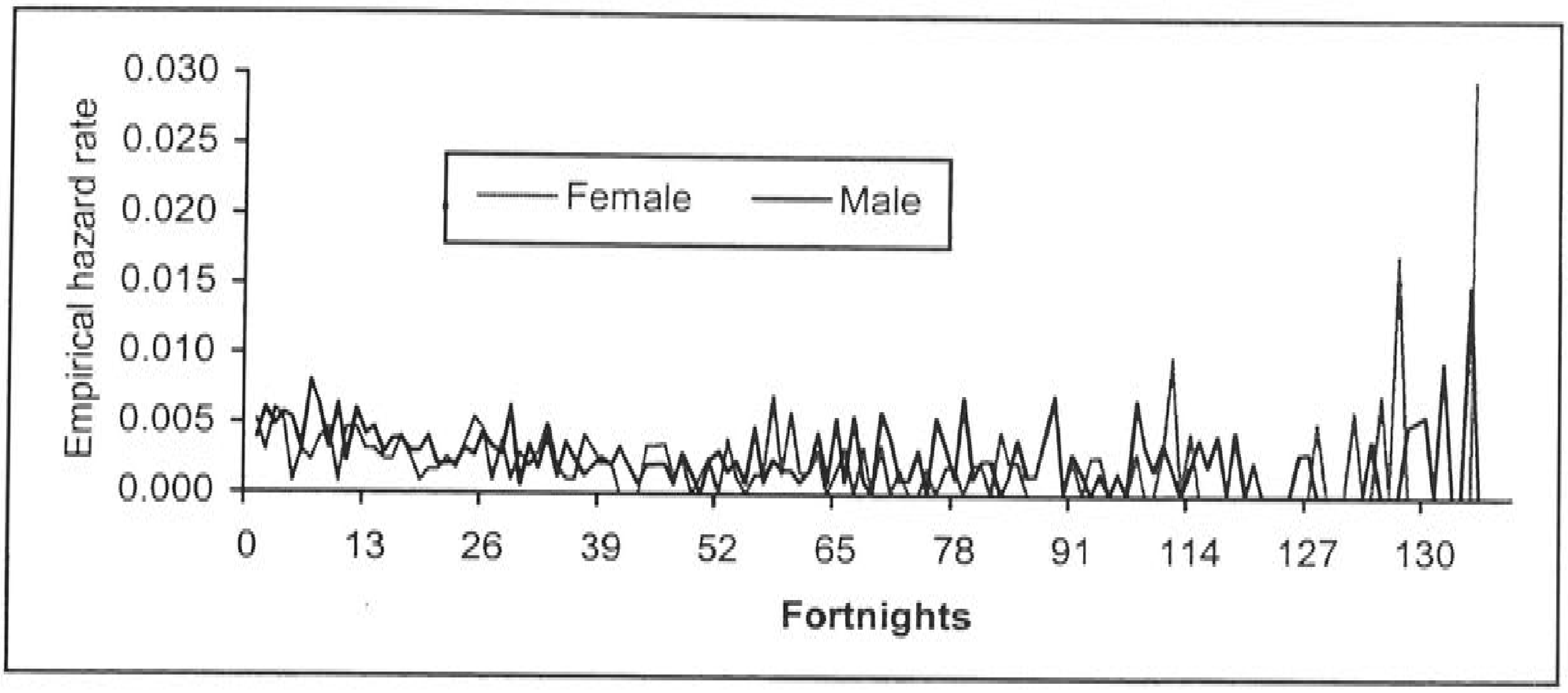


Figure 5.2b: Empirical hazard function by gender



Figures 5.3a and 5.3b plot the empirical survival and hazard functions by marital status. The survival rate of married recipients is a little lower than that of single persons. But the difference is not significant.

Figure 5.3a: Empirical survival function by marital status

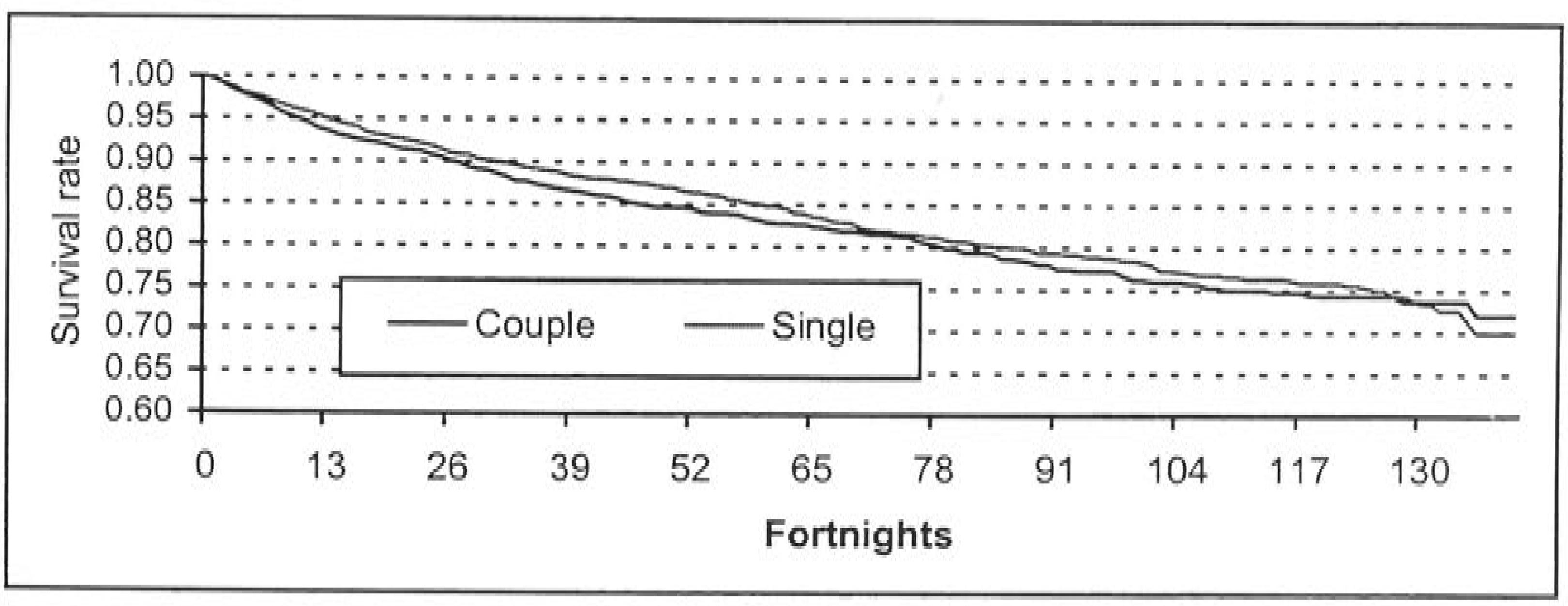
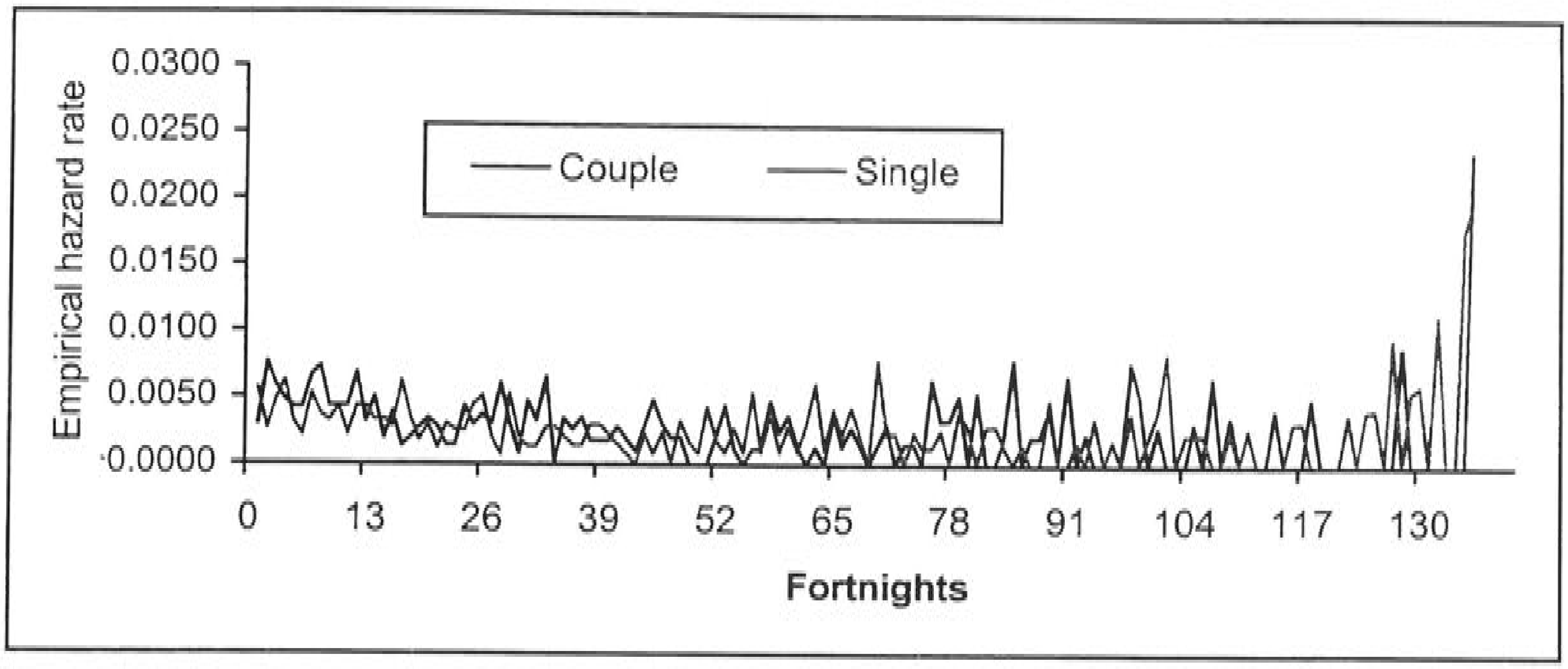


Figure 5.3b: Empirical hazard function by marital status



Figures 5.4a and 5.4b plot the empirical survival and hazard functions by whether or not individuals have earned income. The survival rate of recipients having earned income is slightly higher than that of those with no earned incomes for durations of less than a half year, but thereafter the survival rate becomes lower and this difference becomes larger with duration.

Figure 5.4a: Empirical survival function by whether having earned income

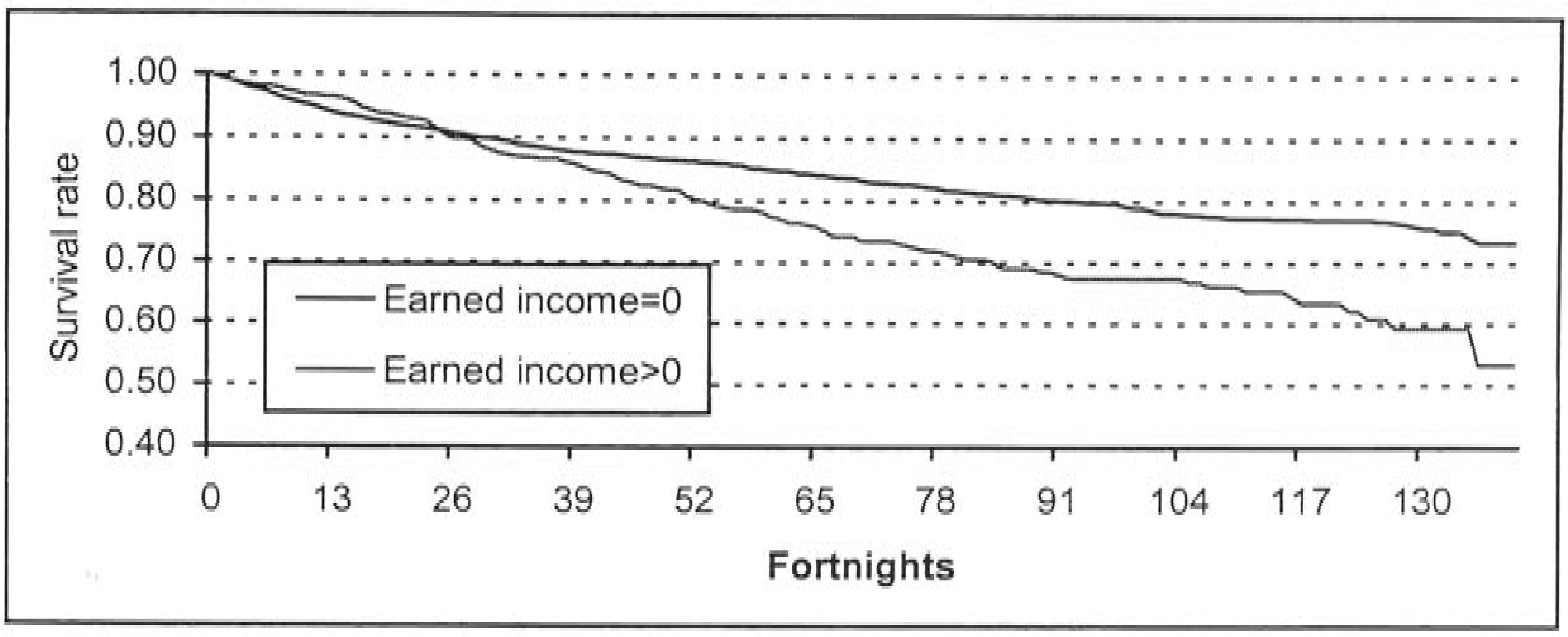
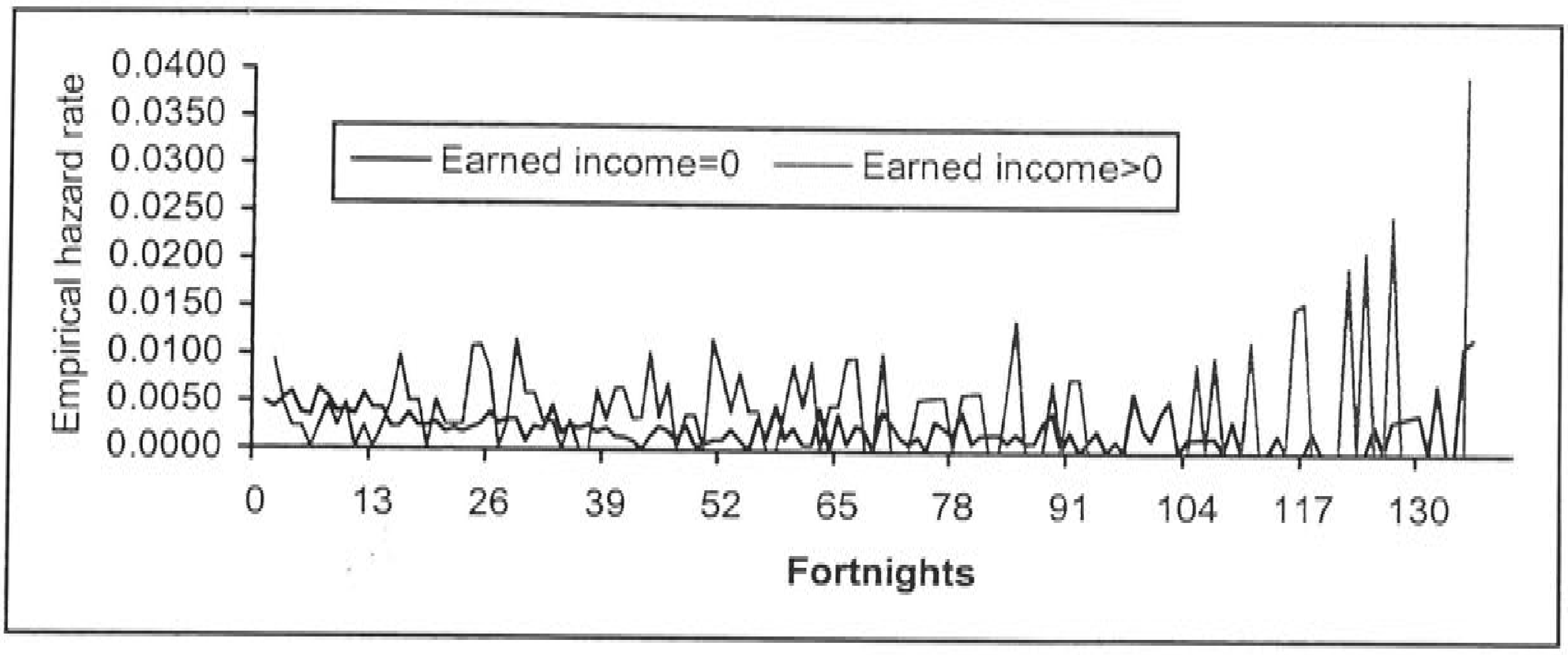


Figure 5.4b: Empirical hazard function by whether having earned income



The series of figures in Appendix 5.B plot these two functions for other variables.

5.4. Duration model estimation

The empirical hazard (and the survival) function treats all spells (individuals) as homogeneous, and the duration dependency shown in the empirical function may be a reflection of differences in individual characteristics rather than true state or duration dependency. The results from the duration model estimation, which controls for observable characteristics and unobserved heterogeneity, are presented in this section.

To control for covariates the proportional hazard duration model is used whereby

$$h_i(t) = h_0(t)\exp\{X_i(t)'\beta\} \qquad (5.8)$$

where $h_i(t)$ is the hazard for person i, $h_0(t)$ is the baseline hazard common to all individuals and $X_i(t)$ is a vector of observable characteristics, some of which may vary with t as will become clear shortly. β is a vector of parameters to be estimated. For different values of $X_i(t)'\beta$, the hazard function for individual i is shifted proportionally up or down relative to the baseline hazard.

A nonparametric baseline hazard estimation approach is implemented here, which is an extension of Prentice and Gloeckler (1978) and is detailed in Meyer (1990), Lancaster (1990), and Barrett (2000). The baseline hazard is estimated nonparametrically as a piece-wise constant function. The time axis is divided into a finite number of intervals and a separate baseline hazard parameter is estimated for each interval. This approach provides a very flexible method for a parametric functional form for the baseline. This is an important advantage of the specification for it has been shown that misspecification of the baseline hazard is a major source of error in drawing inferences concerning both the presence of duration dependence (Blank, 1989; Manton, Stallard and Vaupel, 1986) and the impact of covariates (Dolton and van der Klaauw, 1995; Heckman and Singer, 1985).

The log likelihood function for this specification with a sample of N spells is given by:

$$l(\beta,\gamma)=\sum_{i=1}^{N}\delta_i \log(1-\exp(\exp[\gamma(k_i)+X_i(k_i)'\beta]))-\sum_{t=1}^{k_i-1}\exp[\gamma(t)+X_i(t)'\beta] \qquad (5.9)$$

where k_i is the observed length of the i^{th} welfare spell, δ_i equals one if the spell terminates before becoming right-censored and δ_i is zero if the spell is right-censored. In maximizing the log likelihood the $\gamma(t)=\log[\int h_0(u)du]$ are treated as parameters to be estimated[14].

As in the general linear model, unobserved heterogeneity is also a concern in the duration model. Heckman and Singer (1984a, 1984b) show that the presence of population heterogeneity induces a negative bias in the hazard function, potentially producing estimates of a decreasing hazard when the true underlying hazard is flat or increasing. The heterogeneity may be accounted for by incorporating the unobservable variable, say θ_i for individual i, into the hazard function as $h_i(t,X_i(t),\theta_i)$. The piecewise proportional hazard model may be extended to allow

[14] See Table 5.4 for the time intervals for the baseline hazard parameters.

for the unobserved heterogeneity by assuming that the unobserved variable takes a multiplicative form,

$$h_i = \theta_i h_0(t)\exp\{X_i(t)'\beta\}. \tag{5.10}$$

Maximum likelihood estimates of the parameter vector and baseline hazard are then obtained by conditioning on the likelihood function on θ_i and then integrating over the distribution of θ_i. This approach requires specifying an explicit functional form for the distribution of θ_i. One popular distribution is the gamma, which gives a closed form expression for the likelihood function[15]. This is the approach taken here. However, for the whole sample when unit gamma heterogeneity is assumed, the estimate of the variance term always converged toward zero and the model collapsed to that without unobserved heterogeneity. Consequently, model estimates without heterogeneity are reported below.

At first glance the rejection of model estimation with unobserved heterogeneity is strange. Presumably DSP benefit is based on individual medical condition and leaving this program then reflects a recovery from the disability which makes the recipient eligible for the benefit. Because the model does not include a health condition variable (because it is not available), we would expect there must be unobserved heterogeneity which at least reflects the health condition of a recipient. That this does not happen implies that the observable variables included in the model can explain the exit behaviour of DSP recipients, or that these variables also reflect the health conditions of DSP recipients. The impact of health condition on the exit behaviour is then absorbed into these included covariates. If this is true, it supports the argument that the disability behaviour is not only determined by medical factors, but individual characteristics (e.g., age) and socio-economic factors (e.g., labour market conditions) may also play important roles (Aarts and de Jone, 1992).

For convenience of interpretation, Table 5.2 presents the hazard ratio estimates for the covariates. For category (or dummy) variables, the hazard ratio estimate for a category (for example, being single) shows the ratio of the hazard rate of a recipient belonging to that category (e.g., being single) to the hazard rate of a recipient who belongs to the omitted category in the model specification (e.g., being married). For a continuous variable, the hazard ratio estimate shows the ratio of the hazard rate of a recipient with one more unit of that variable to the hazard rate of a recipient without the one more unit. Table 5.5 reports the baseline hazard rate estimates. Tables 5.A2 and 5.A3 in Appendix 5A report the parameter estimates for the covariates and the baseline hazard respectively.

From Table 5.2 the following covariates are statistically significant in determining the hazard rate of exiting DSP: entry age between 16 and 20, entry age 56 and over, gender, country of birth, amount of earned income, having or not having unearned income, and the source of recipients.

Since the omitted entry age group is 41-50, the hazard ratio estimates for all other entry age groups are relative to the 41-50 group. The results show that the impact of entry age on the hazard rate is a kind of inverse U shape. Other things being equal, persons who enter into DSP between age 21 and 40 have the highest hazard rate. Although the results imply that the hazard rate of the three age groups 21-30, 31-40 and 41-50 are different, the differences are not statistically significant. The youngest age group has the lowest hazard rate. For persons entering into DSP younger than 21 the hazard rate is about 55 percent lower than the 41-50 group. The hazard rate of the 51-55 age group is 23 percent lower than the 41-50 group and this difference is weakly significant. For persons over 45, the hazard rate is about 38 percent lower than the 41-50 group.

[15] Alternatively, Heckman and Singer (1984a) suggest letting the unobservable take a non-parametric form. However, Trussell and Richards (1985) indicate that this is just as subject to distributional biases as when the distribution of t is estimated non-parametrically.

Table 5.2: Duration model estimation results of covariates, hazard ratio estimates

Covariates	Hazard ratio estimate
entry age 16-20	0.4521***
entry age 21-30	1.0242
entry age 31-40	1.0989
entry age 51-55	0.7692*
entry age 56 and over	0.6212***
sex (male=1)	1.4493***
marital status (single=1)	0.9783
country of birth (foreign=1)	0.7994**
homeowner (non-owner=1)	0.7696*
free rent (=1)	1.1406
government rent (=1)	0.9193
private rent (=1)	1.1876
number of children	1.0079
age of the youngest child	1.0026
having earned income (=1)	0.9794
average amt of earned income/100	1.3259***
having unearned income (=1)	0.6610***
average amt of unearned income/100	1.0611
NT(=1)	1.2581
QLD(=1)	1.0680
SA(=1)	1.2134
TAS(=1)	0.6732
VIC(=1)	0.9809
WA(=1)	1.2295

(Continue)

Table 5.2: Duration model estimation results of covariates, hazard ratio estimates (Continued)

Covariates	Hazard ratio estimate
cohort 96 (=1)	1.1736
cohort 97 (=1)	1.2837*
cohort 98 (=1)	1.3628*
cohort 99 (=1)	1.1044
enter DSP from outside income support system (=1)	1.9408***
transition from other income supports (=1)	1.5521***
unemployment rate	0.9133
No. of spells	3658
No. of failures	655
Log likelihood	-2381.27

*** Significant at 1 percent level; ** 5 percent level; * 10 percent level.

The inverse U shape impact of entry age on the hazard rate may reflect individual health conditions and labour market prospects of DSP recipients. For those who enter into DSP at a very young age (i.e. less than 21 years), their disabilities might have presented for a long time (say, from birth) and recovery may be very difficult if not impossible. Therefore, they have the lowest hazard rate. For persons who enter into DSP between age 21 and 50, their disabilities are unlikely to have been present from birth and they are more likely to have been employed for a period of time before entering into DSP. In addition, as they are at their labour market prime age, they may prefer to work rather than to stay on DSP if they could recover from their disabilities. Also, compared with older persons their age makes it easier to get a job if they recover. These issues may partly explain why for these age groups the hazard rate is the highest. For the older age groups, 51 and over, like the 21-50 group, their pre-benefit work experience may also make them prefer to work if they could recover. But because of their age the probability of getting a job must be lower and the older the age the lower the probability. This may explain why for the older persons, the hazard rate decreases with entry age.

The hazard rate between males and females is significantly different. Other things being equal, being male increases the hazard rate by 45 percent. If exiting DSP is not dominated by death, this difference may reflect difference in labour market opportunities between males and females. It is also possible that the difference in socially expected roles between males and females may also have a greater stigma impact on male DSP recipients than on female recipients. The difference in the hazard rate between males and females may also reflect the differences in the nature of their disabilities. It is perhaps more likely that more male disabilities will be the results of accidents or job injuries (given the occupation difference between males and females), and this kind of disability may be easier to recover from than chronic diseases.

Whether a recipient is born in Australia is also important in determining the hazard rate. Every thing else being equal, if a person is not Australian born, this reduces the hazard rate by about 20 percent compared with a person born in Australia. This may be because an immigrant is possibly less competitive in the labour market than a native Australian.

The financial variables are also very interesting. Having earned income seems to reduce the hazard rate, although the reduction is not statistically significant. The amount of earned income, however, does have a significant impact. The variables measuring the amount of earned and unearned income enter the model in units of $100. The magnitude of the hazard ratio estimate implies that an increase in earned income by $100 per fortnight will raise the hazard rate by 33 percent[16]. Having earned income shows that the person has some ability to work, but having earned income, of itself, may not make a significant difference in terms of the probability of leaving the program, since DSP recipients are allowed to have earned income (though up to a

[16] As the variable, the amount of earned income, is the individual average over the DSP recipiency period, its coefficient is identified by the variation of this variable across individuals. It is likely, however, that the earned income of each individual may vary with the duration on DSP. Individual earned income may increase with duration if the individual recovers from disability gradually. It may also decrease with duration if individual disability becomes worse or recipiency of benefit makes the individual prefer to work less.

specified level[17]). However, if the earned income is very high, the person has an incentive to leave DSP for work because the opportunity cost of staying on DSP is high now. In addition, the benefit will be cancelled if a recipient's earned income is too high because DSP is subject to means test.

Having unearned income reduces the hazard rate, compared with having no unearned income, by 24 percent. One explanation may be that having unearned income may reduce the incentive of a recipient to leave the program for work, and they prefer to combine the disability benefit with other unearned income rather than leave DSP for work. The amount of unearned income has no significant impact, although it has the right sign.

For the recipient source variables, the omitted category is recipients who transferred from unemployment benefit. The hazard ratio estimates imply that the hazard rate of those who entered into DSP from outside the income support system is almost twice that of those who transferred from unemployment benefit. The hazard rate of those who transferred from other income support payments is 55 percent higher than those who transferred from unemployment benefit. Recipients who transferred from unemployment benefit have the lowest hazard rate.

Looking at those who transferred from unemployment benefit (i.e. they did not go directly to DSP), it may be that their disabilities were not as severe (or obvious) as those who entered into DSP directly (i.e. from outside the income support system). However, once having entered, the previously unemployed leave more slowly than direct entrants. The lower hazard rate may imply that the experience of unemployment may have reduced their incentive to give up DSP for work. Perhaps they have had bad experiences in the labour market and lack confidence about their ability to perform if they leave DSP. If this is true, it provides supportive evidence for the discouraged worker story. Alternatively, those who came from outside the income

[17] Income subject to an income test in Australia is the combination of earned and unearned income. For example, in June 2002, for a single DSP recipient, income up to $112 per fortnight has no impact on DSP payment. Income over this threshold will reduce DSP payment. DSP payment will be totally withdrawn if income is equal or greater than $1181 per fortnight for a single person. These thresholds vary with number of children and marital status.

support system leave more quickly because the nature of their disabilities may be different. The disabilities of those who came from outside the income support system might be more likely to be caused by accidents or job injuries. Recovery from these disabilities may be easier or quicker than it is for chronic disabilities or perhaps the recipients received a substantial amount of compensation. If they recover, they will leave DSP by themselves. If they receive a substantial amount of compensation, it is likely they will be forced to leave due to DSP means test.

Recipients from other income support payments also have a much higher hazard rate than those who transferred from unemployment benefit. Given the composition of this recipient source, this result may not be a surprise (see Table 5.3).

Table 5.3: Payment types prior to transition to DSP of those who transferred from other income support payments (other than unemployment benefit)

Payment types prior to transition		**Number of**	**Percent**
Codes	**Definitions of Codes**	**persons**	**(%)**
CAR	Carer payment	22	2.46
F-W/FMM/F-A	Family payments	45	5.04
PA/PTA	Partner allowance	109	12.21
PGL	Partner of persons on low income	17	1.90
PGN/PGP/MPA	Partner of Newstart, Pension and Mature Age Allowance recipients	39	4.37
PPS/SPP	Sole parent payment	75	8.40
SA/SKA	Sickness allowance	433	48.49
SPB/SPL	Special benefit	72	8.06
WA/WDA/WID	Widow allowance & widow pension	41	4.59
WFA/WFD	Wife pension	31	3.47
Others	Including drought relief, crisis, disability wage supplement and other parenting payments.	9	1.01
Total		893	100.00

Among those who transferred from other income support payments, about half were from sickness allowance payment. Given the temporary nature of the sickness allowance, it is possible that a substantial proportion of these recipients could recover from their sickness even after they transferred to DSP. Another 18 percent were partners of income support payment recipients, if their partners of these DSP recipients lost their entitlements to income support payment, say through high-earned income, it is also likely that these recipients would lose their entitlement to DSP.

Another weakly significant variable is home ownership. Home owners have a higher hazard rate than non-home owners. It is very difficult to explain why this is the case.

The unemployment rate is included as a time varying variable. This rate is added to each record (not person) according to state, gender, year and quarter. The impact of the unemployment rate variable has the right sign - an increase in the unemployment rate reduces the hazard rate. But this effect is not accurately estimated. This may suggest that labour market conditions may not have much effect on DSP outflows. This is in contrast to the finding in the earlier chapters that DSP inflows are significantly affected by labour market conditions. This may imply that when individuals make a decision on whether to participate in the DSP program, they take into account labour market conditions and their prospects of employment. But, once on the program, labour market conditions are not important in their decision on whether to stay in the program or leave it.

The cohort variables provide some information on whether recipients entering DSP at different years are statistically different in terms of leaving the program. All cohort hazard rates are compared with the 1995 cohort. It seems that recipients entering after 1995 have a higher hazard rate than those entering in 1995, but only differences between the 1997 and 1995 cohort and the 1998 and 1995 cohorts are weakly significant.

The number of children and age of the youngest child are not significant. Neither is there any state specific impact on the hazard rate.

Table 5.4 and Figure 5.5 present the estimates for the piece-wise baseline hazard function for the specified duration intervals[18].

[18] Note that the hazard rate estimate for a specific duration interval equals the exponential of the corresponding coefficient estimate.

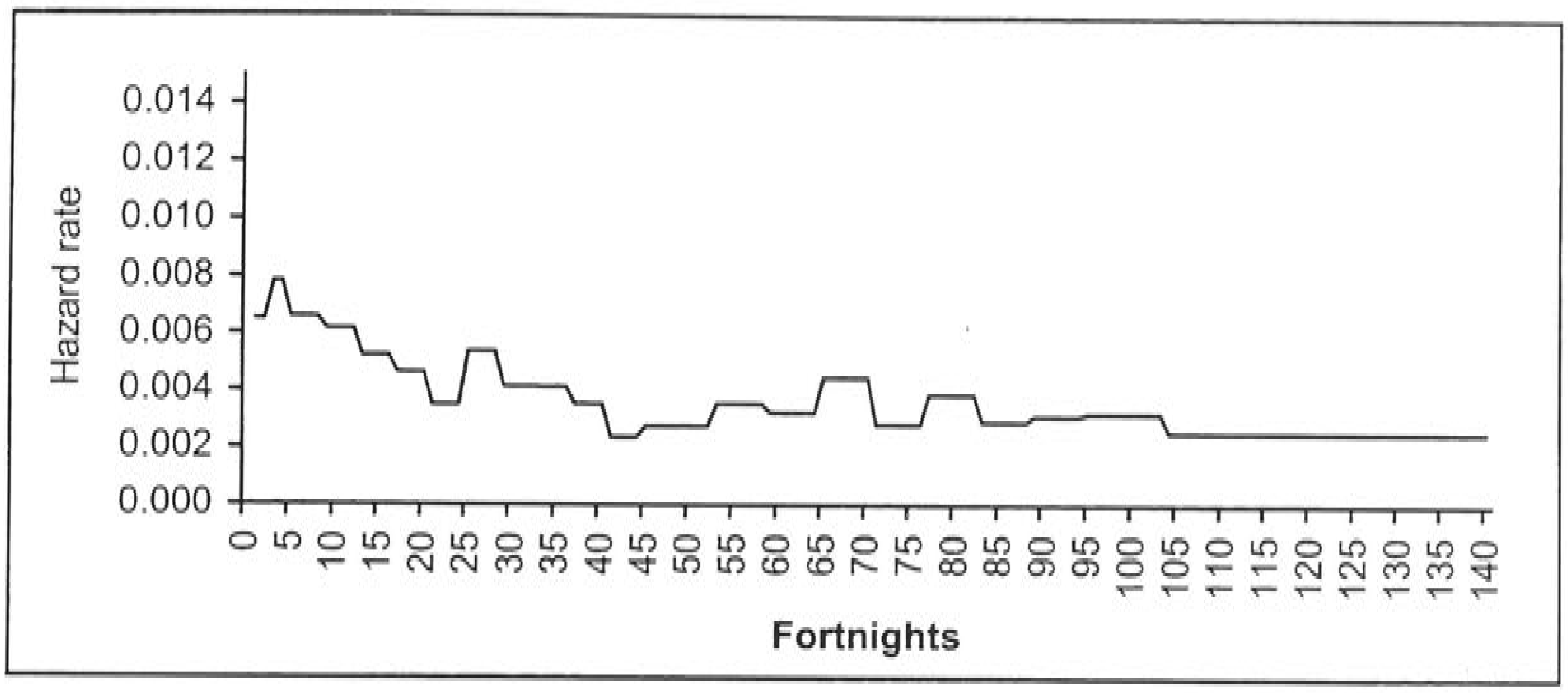
It appears that the baseline hazard rate peaks during the 3 to 4 fortnight interval and then declines monotonically until the 24th fortnight. It picks up at around the one year period and then falls again. For durations between 44 fortnight and four years the hazard rate fluctuates, but it appears to move around a constant average. Because unobserved heterogeneity is rejected in the model estimation, the declining baseline hazard rate suggests duration dependence during the first 44 fortnights period, but once a person stays on the program for longer than 44 fortnights the baseline hazard seems to no longer depend on the duration.

Table 5.4: Duration model baseline hazard rate estimates

Time intervals (foutnights)	Hazard rate
0-2	0.00653
3-4	0.00783
5-8	0.00660
9-12	0.00616
13-16	0.00523
17-20	0.00463
21-24	0.00350
25-28	0.00538
29-32	0.00415
33-36	0.00414
37-40	0.00354
41-44	0.00237
45-52	0.00277
53-58	0.00355
59-64	0.00323
65-70	0.00447
71-76	0.00282
77-82	0.00388
83-88	0.00292
89-94	0.00314
95-103	0.00324
104+	0.00257

*All estimates are significant at 1 percent level.

Figure 5.5: Baseline hazard rate estimates



5.5. Conclusion

This chapter applies the duration model to the FaCS LDS data to identify factors that determine the hazard rate of leaving the DSP. Many factors affect the rate of leaving DSP. The estimation results show that entry age, gender, whether or not a recipients is born in Australia, amount of earned income while on DSP, having or not having unearned income, and whether recipients transferred from unemployment benefit have significant impacts on the hazard rate.

The impact of entry age is not linear. Persons who enter into the program between age 21 and 50 have the highest hazard rate. Persons younger and older than these ages on entry into DSP will have a lower hazard rate. Furthermore, for those older than 50 years of age at entry, the older the entry age, the lower the hazard rate.

Females have a lower hazard rate than males and persons born in Australia have a higher hazard rate than do non-Australian born recipients. An increase in earned income will increase the hazard rate and having unearned income lowers the hazard rate. Persons coming from unemployment benefit have a lower hazard rate than both those directly from outside the income support system and those from other income support payments.

In summary, there is a clear link between recipient characteristics and how long they are likely to stay on the DSP. Those who leave the DSP program most quickly are characterized as middle age (especially, 31-40), male, Australian born, coming from outside the income support system, having no unearned income and with high earned income when receiving DSP benefit. Those who are the slowest to leave are characterized as very young (younger than 21 years old) or near to the Age Pension age when they entered into DSP, female, non-Australian born, have transferred from unemployment benefit, have unearned income, and without earned income.

Although the exit destinations of these recipients are unknown (except for those who transferred to the Age Pension), it seems that persons who have the characteristics associated with the most rapid exit from the DSP would have a better chance of success in the labour market than those recipients who leave the slowest. It would probably be reasonable to suggest then that the former are most likely to return to work on exit from the DSP.

An important policy implication of the finding that recipients with different characteristics have different potential to leave is that any policy or program aimed at facilitating outflows of DSP recipients should focus on those who are most likely to leave and treat recipients differently.

Although those recipients who transferred from unemployment appear to leave the slowest, their disability may not be as severe (or obvious) as those who directly entered into DSP from outside the income support system. Therefore, those recipients who transferred from unemployment may have the potential to leave faster. Because this group of recipients make up a large proportion of DSP inflows, the behaviour of this recipient group requires further study.

Although the unemployment rate variable produces an insignificant impact, this may nevertheless have important implications. Together with the finding in Chapter 3, this finding implies that worsening labour market conditions push the disabled people into the DSP program, but a recovery or a boom of an economy will not draw DSP recipients out of the program. Because once in, DSP recipients tend to stay on the program for a long time (see next chapter), this suggests that we need to search for better programmatic responses to the variation of labour market conditions.

With the rejection of existence of unobserved heterogeneity in the model estimation, the decline of the estimated baseline hazard rate for duration less than 44 fortnights implies that negative duration dependence of exit from DSP exists to some degree. For recipients with longer duration, the baseline hazard rate appears to be constant. This may suggest, if something can be done to enhance the hazard rate, it is better to act at the earlier stage.

The overall significance of the model without inclusion of a health condition variable and the rejection of unobserved heterogeneity, implies that demographic and economic factors are important in determining disability benefit participation and disability is not only determined by health conditions per se. This does not necessarily mean that some recipients are not really disabled but may suggest that other factors can signify their disabilities, such as losing a job.

Higher hazard rate implies shorter duration on the DSP. All the variables that have a positive impact on the hazard rate will reduce the completed duration of the recipients who have those characteristics as will be shown in the next chapter.

Appendix 5A

Table 5.A1: Summary statistics for persons who transferred to the Age Pension from DSP

	Persons who transferred to the Age Pension
Number of persons/spells	284
Average duration (fortnights)	55.80
	(32.38)**
Demographic characteristics	
Male (%)	71.13
Age at entry	61.70
	(2.24)
Male	62.87
	(1.37)
Female	58.80
	(1.02)
Marital status__couple(%)	73.59
Australian born (%)	61.97
Proportion having children (%)	3.52
Number of children***	1.5
	(0.84)
Age of the youngest child***	11.7
	(4.06)
Home ownership and rent type	
Home owner (%)	69.01
Government rent (%)	4.58
Private rent (%)	11.62
Free rent (%)	4.93
Other rent (%)	78.87
Financial variables	
Earned income>0 (%)	7.04
Average earned income****	145.31
	(134)
Unearned income>0 (%)	73.94
Average unearned income****	111.72
	(140)

(Continue)

Table 5.A1: Summary statistics for persons who transferred to the Age Pension from DSP (continued)

	Persons who transferred to the Age Pension
Where coming from	
Transition from	
unemployment (%)	16.55
other income support payments (%)	20.42
Outside income support system (%)	63.03
Proportion by states	
NSW & ACT	36.62
NT	0.35
QLD	16.55
SA	11.27
TAS	2.11
VIC	23.94
WA	9.15
Proportion by entry years	
1995	38.73
1996	27.46
1997	18.31
1998	11.62
1999	3.87

** Standard deviations in parentheses.

*** For those who have children.

**** For those who have earned or unearned income.

Table 5.A2: Duration model parameter estimates and standard errors of coviarates

Covariates	*Coefficient*	*Std. Err*
entry age 16-20	-0.7939***	0.2484
entry age 21-30	0.0239	0.1632
entry age 31-40	0.0943	0.1341
entry age 51-55	-0.2624*	0.1392
entry age 56 and over	-0.4762***	0.1387
sex (male=1)	0.3711***	0.1050
marital status (single=1)	-0.0220	0.1120
country of birth (foreign=1)	-0.2238**	0.1002
homeowner (non-owner=1)	-0.2619*	0.1543
free rent (=1)	0.1316	0.1949
government rent (=1)	-0.0842	0.1942
private rent (=1)	0.1720	0.1392
number of children	0.0078	0.0680
age of the youngest child	0.0026	0.0140
having earned income (=1)	-0.0208	0.1569
average amt of earned income/100	0.2821***	0.0747
having unearned income (=1)	-0.4140***	0.1243
average amt of unearned income/100	0.0593	0.0430
NT(=1)	0.2296	0.4740
QLD(=1)	0.0658	0.1628
SA(=1)	0.1934	0.2249
TAS(=1)	-0.3956	0.3552
VIC(=1)	-0.0193	0.1321
WA(=1)	0.2066	0.1574
cohort 96 (=1)	0.1601	0.1246
cohort 97 (=1)	0.2497*	0.1446
cohort 98 (=1)	0.3095*	0.1690
cohort 99 (=1)	0.0993	0.2135
enter DSP from outside (=1)	0.6631***	0.1344
transition from other income support (=1)	0.4396***	0.1215
unemployment rate	-0.0907	0.0747

*** Significant at 1 percent level; ** 5 percent level; * 10 percent level.

Table 5.A3: Parameter estimates and standard errors of baseline hazard rate

Time interval (foutnights)	Coeffficient	*Std. Err*
0-2	-5.0319	0.6475
3-4	-4.8492	0.6455
5-8	-5.0204	0.6363
9-12	-5.0893	0.6360
13-16	-5.2531	0.6375
17-20	-5.3748	0.6414
21-24	-5.6542	0.6399
25-28	-5.2254	0.6395
29-32	-5.4858	0.6393
33-36	-5.4878	0.6408
37-40	-5.6427	0.6413
41-44	-6.0445	0.6525
45-52	-5.8907	0.6188
53-58	-5.6413	0.6239
59-64	-5.7339	0.6317
65-70	-5.4095	0.6347
71-76	-5.8710	0.6341
77-82	-5.5516	0.6355
83-88	-5.8376	0.6429
89-94	-5.7649	0.6566
95-103	-5.7336	0.6305
104+	-5.9622	0.5746

*All estimates are significant at 1 percent level.

Table 5.A4: Summary statistics of DSP recipients by recipient sources

	Recipient sources		
	outside	**unemployment**	**other payments**
Demographic variables			
Entry age	48.04	45.18	46.49
	(15.25)*	(12.49)	(10.84)
Entry age of males	49.56	45.94	46.43
	(14.98)	(12.76)	(12.11)
Entry age of females	44.44	43.59	46.54
	(15.28)	(11.74)	(9.84)
Proportion of males	0.7033	0.6782	0.4181
Prop of couples	0.6192	0.3535	0.458
Prop of Aus born	0.6949	0.7213	0.6797
Prop having children	0.103	0.1226	0.2441
Number of children	1.85	1.98	1.9
	(0.91)	(1.18)	(1.12)
Age of youngest child	8.82	8.45	9.03
	(4.76)	(5.34)	(5.41)
Home ownership and rental arrangement			
Home owner	0.5511	0.36	0.4502
Government rent	0.0363	0.1041	0.112
Private rent	0.1416	0.2972	0.28
Other rent	0.8221	0.5977	0.6081

* Standard deviations are in parentheses.

Appendix 5B

Empirical survival and hazard functions by selected variables

Figure 5.A1: Empirical survival function by country of birth

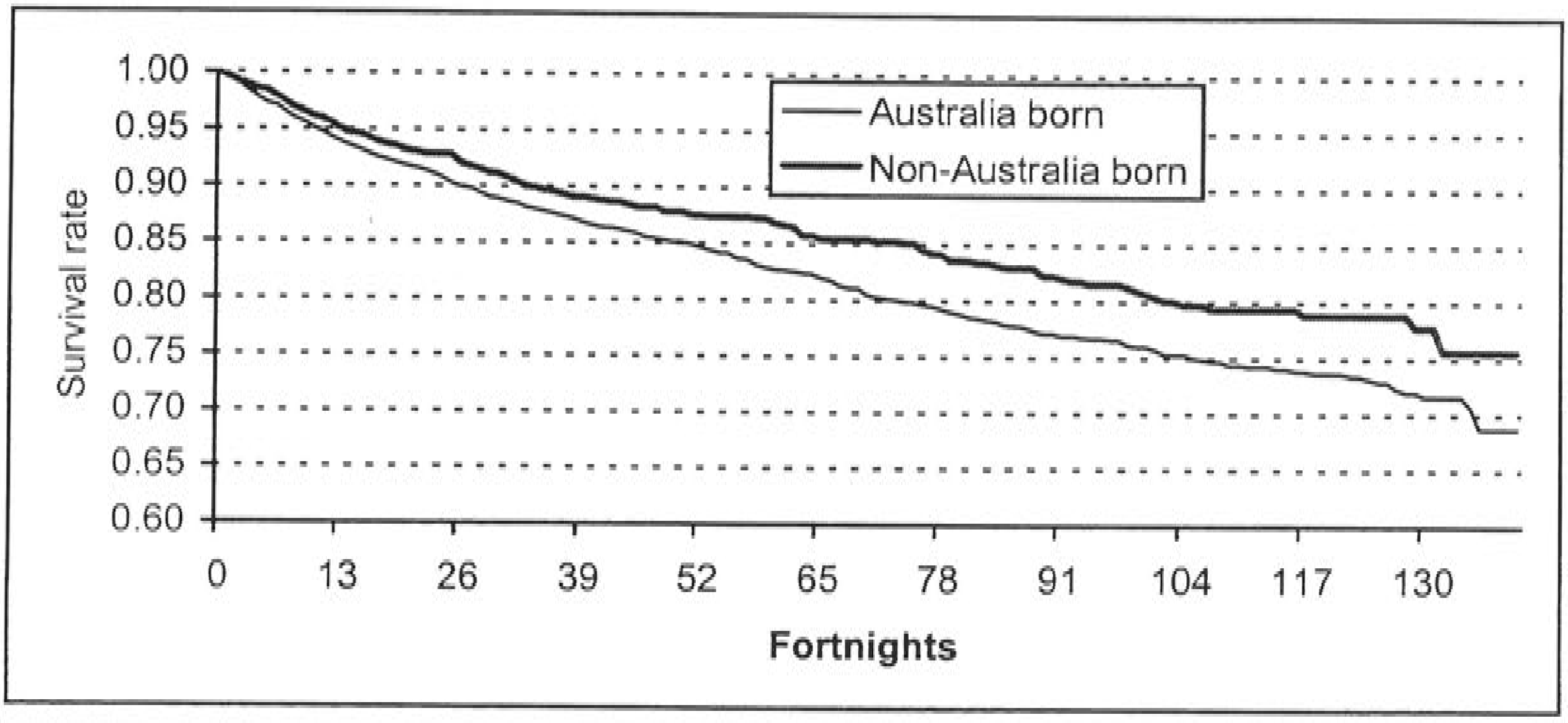


Figure 5.A2: Empirical hazard function by country of birth

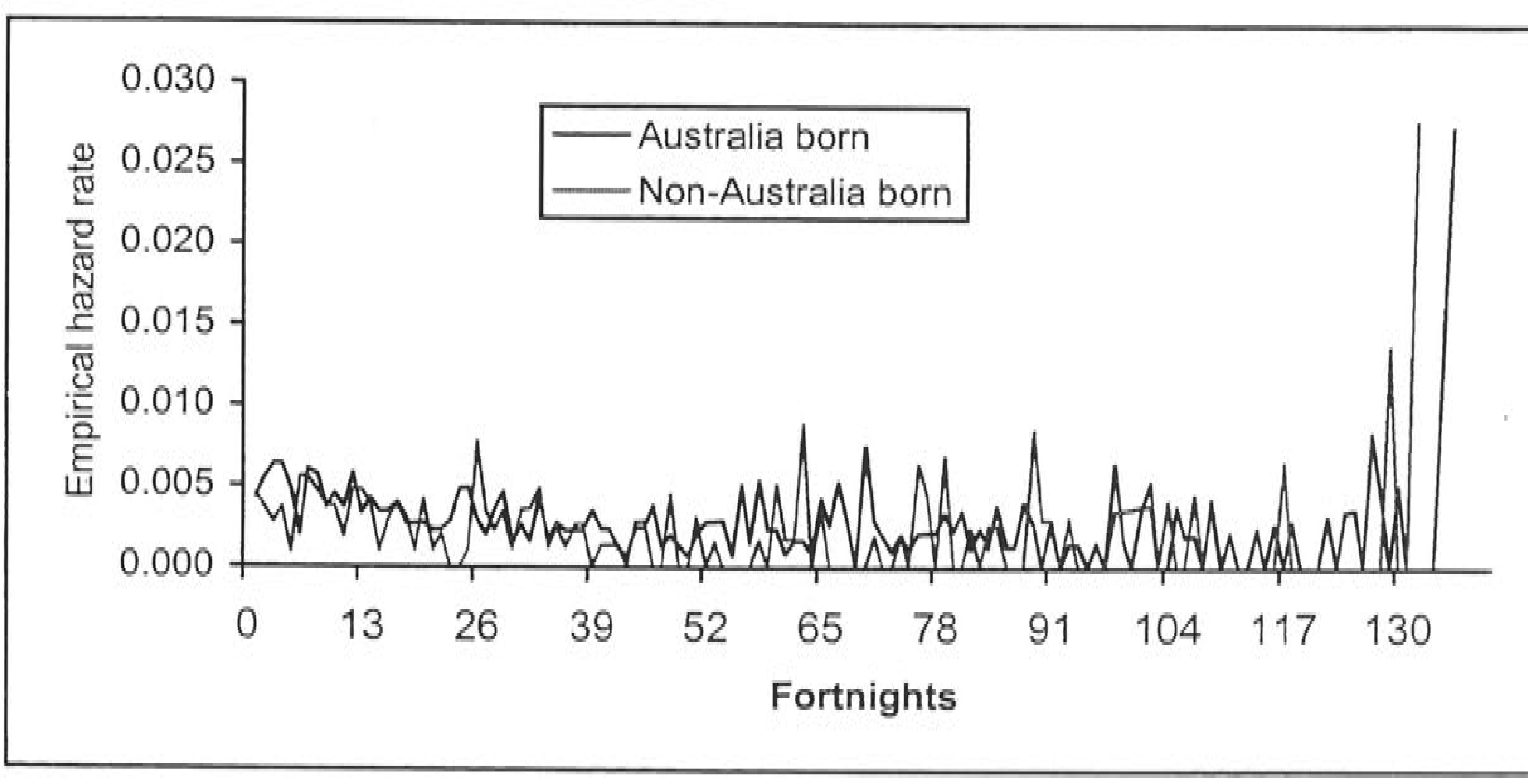


Figure 5.A3: Empirical survival function, age groups 16-20, 21-30 and 31-40

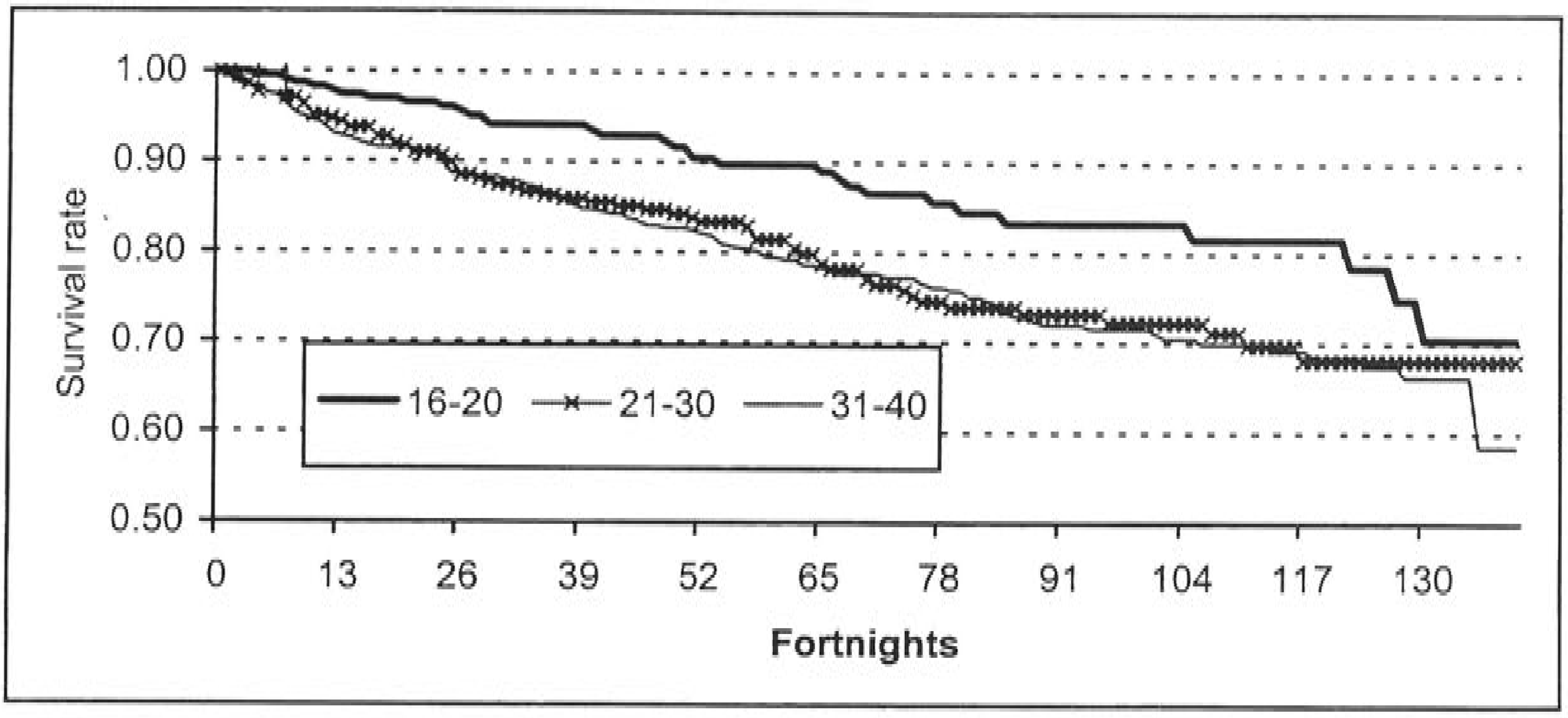


Figure 5.A4: Empirical hazard function, age groups 16-20, 21-30 and 31-40

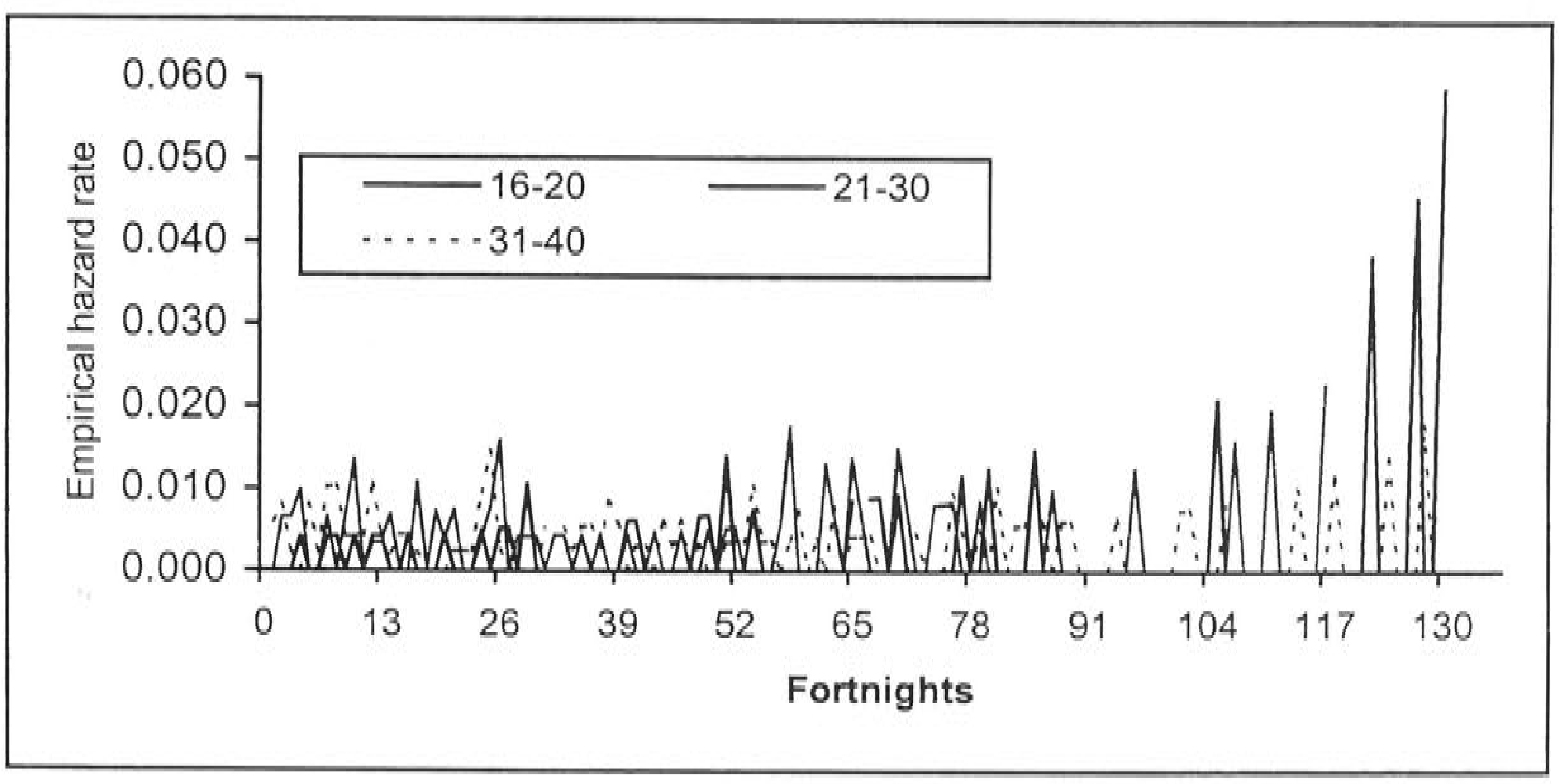


Figure 5.A5 Empirical survival function, age groups 41-50, 51-55 and 55 & over

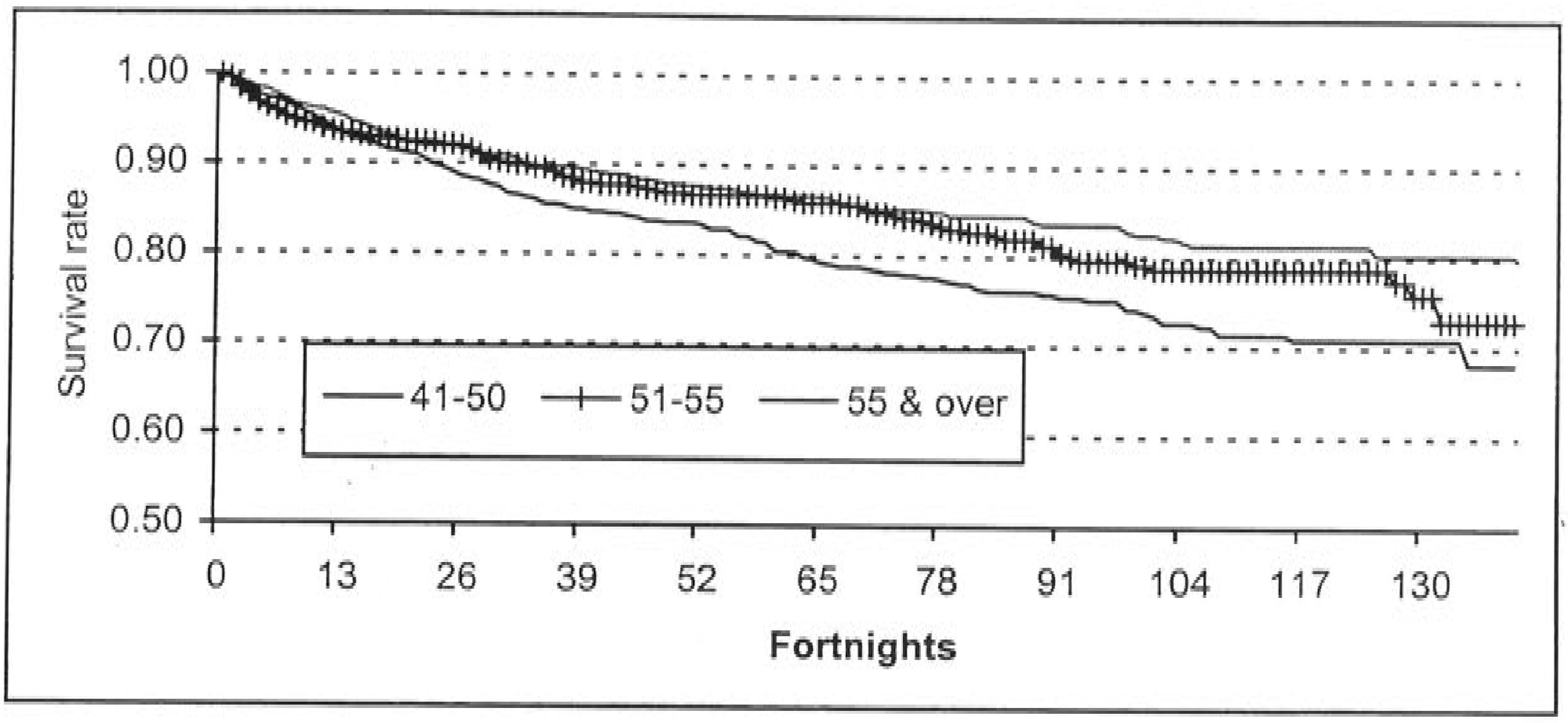


Figure 5.A6: Empirical hazard function, age groups 41-50, 51-55 and 55 & over

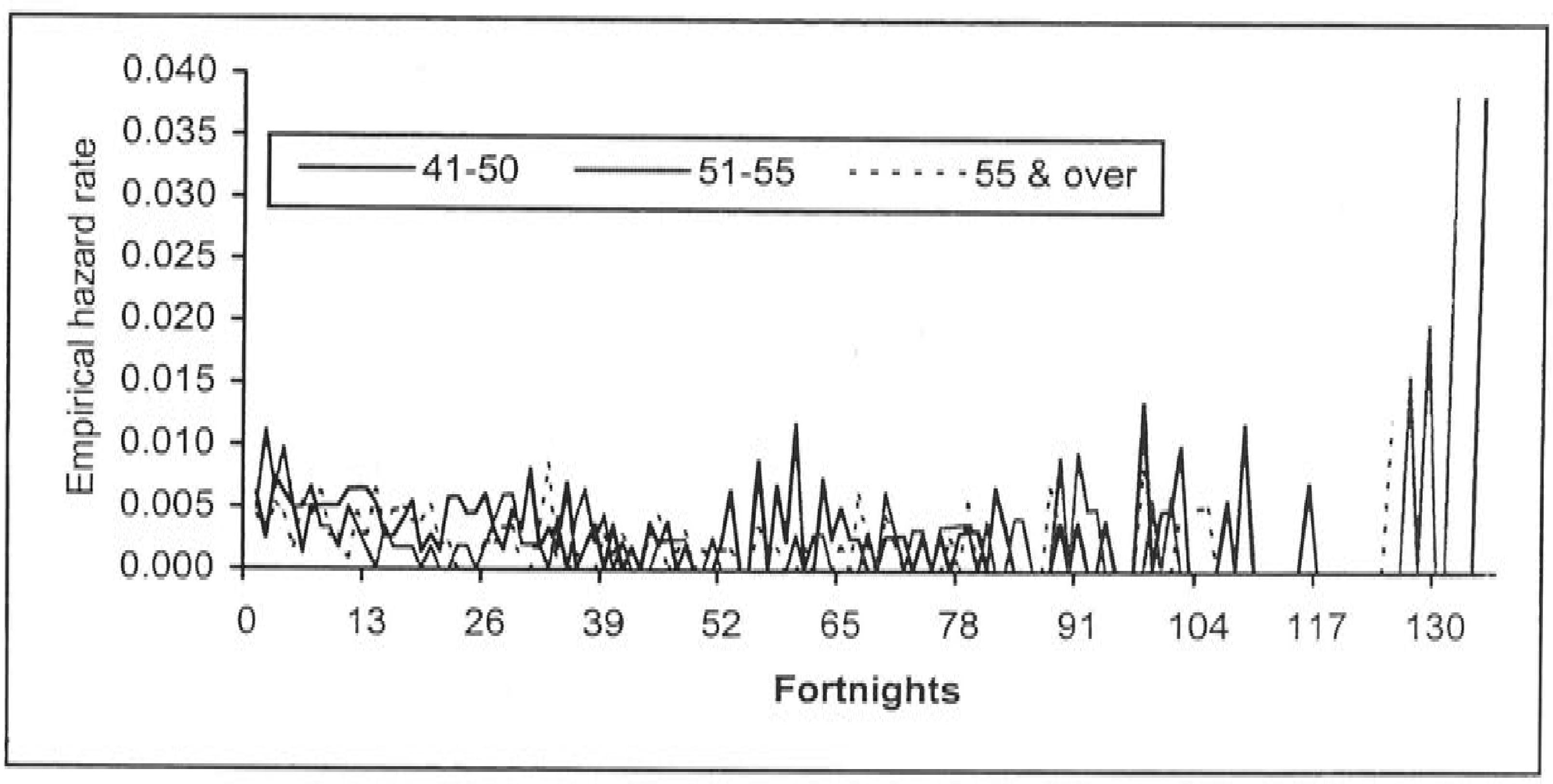


Figure 5.A7: Empirical survival function by whether having children

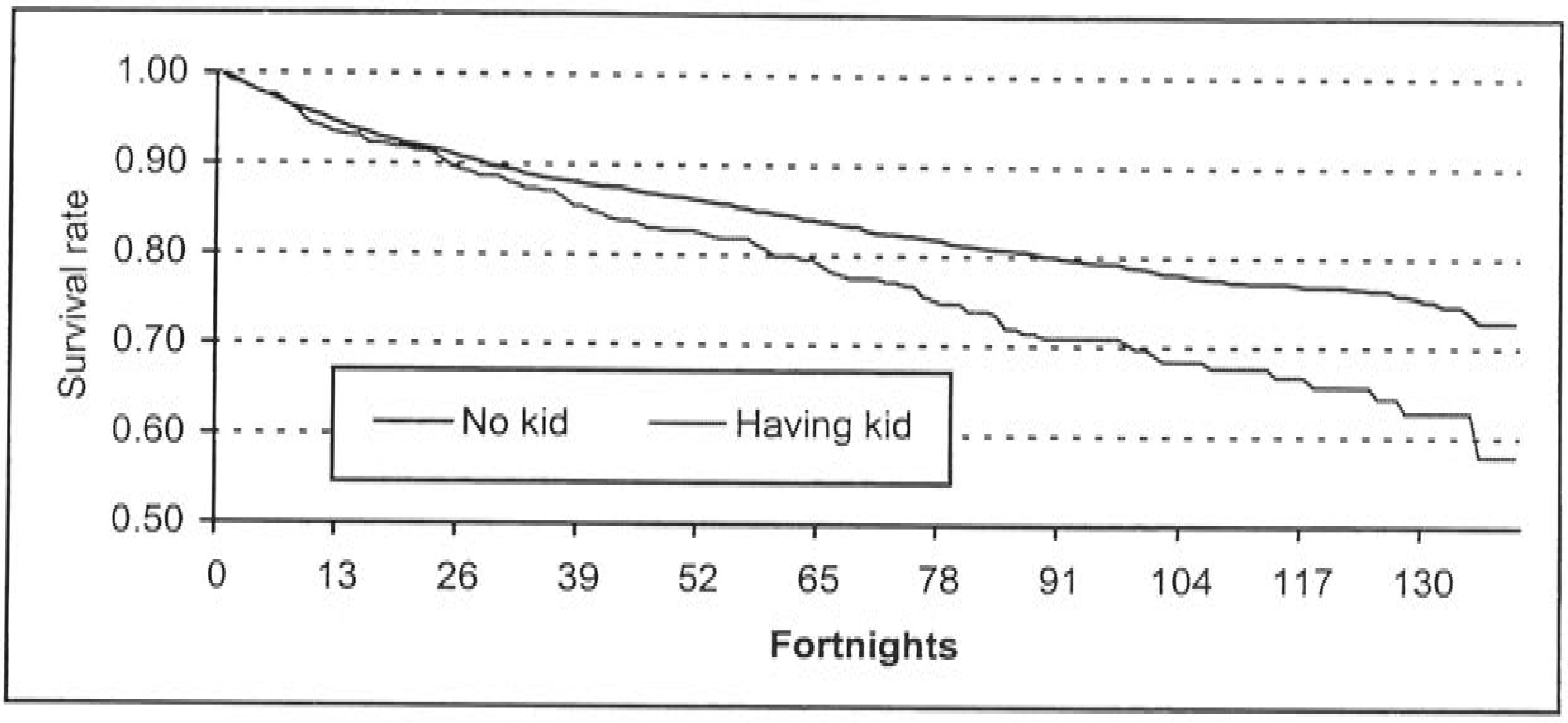


Figure 5.A8: Empirical hazard function by whether having children

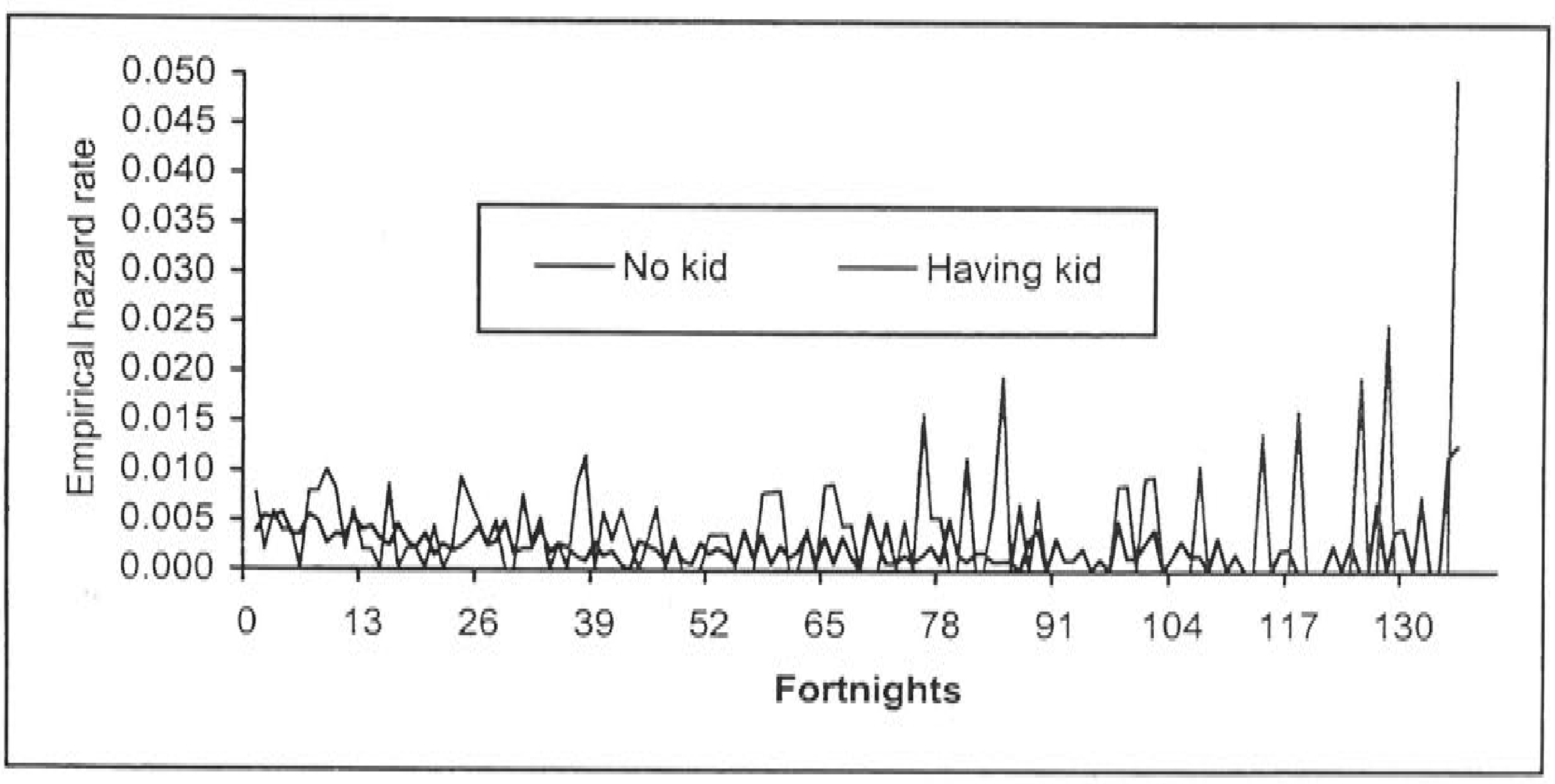


Figure 5.A9: Empirical survival function by homeowneship

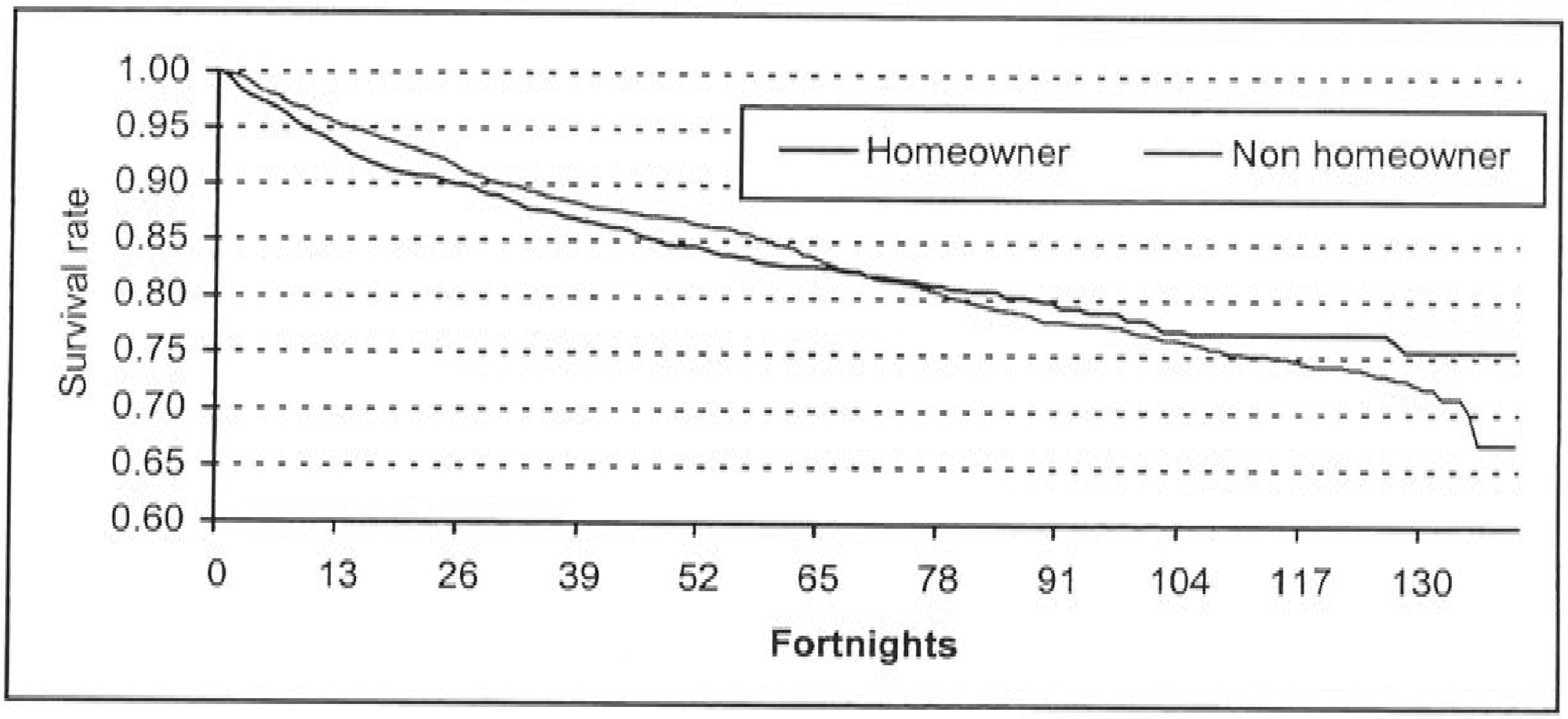


Figure 5.A10: Empirical hazard function by homeownership

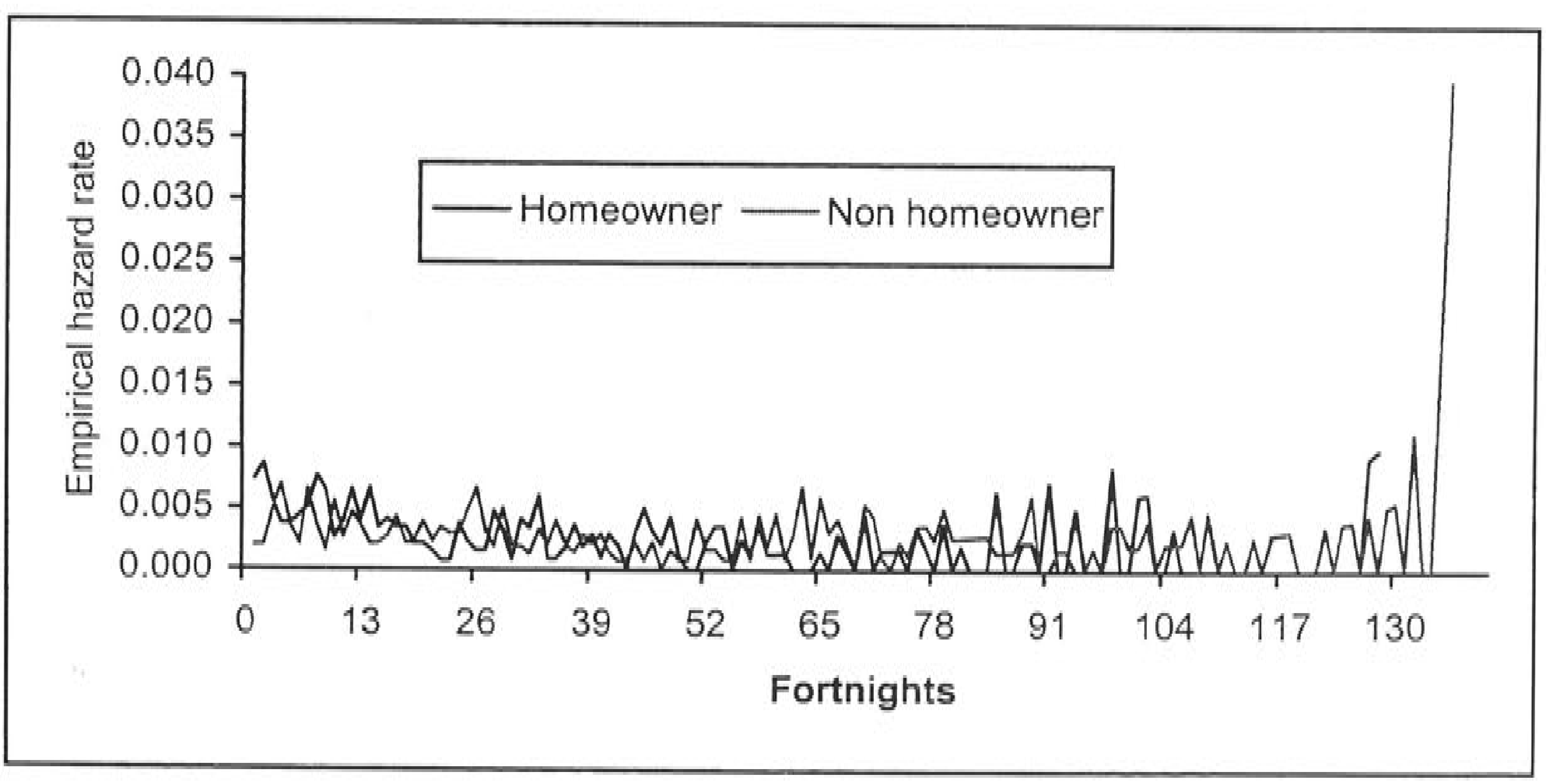


Figure 5.A11: Empirical survival function by rent type

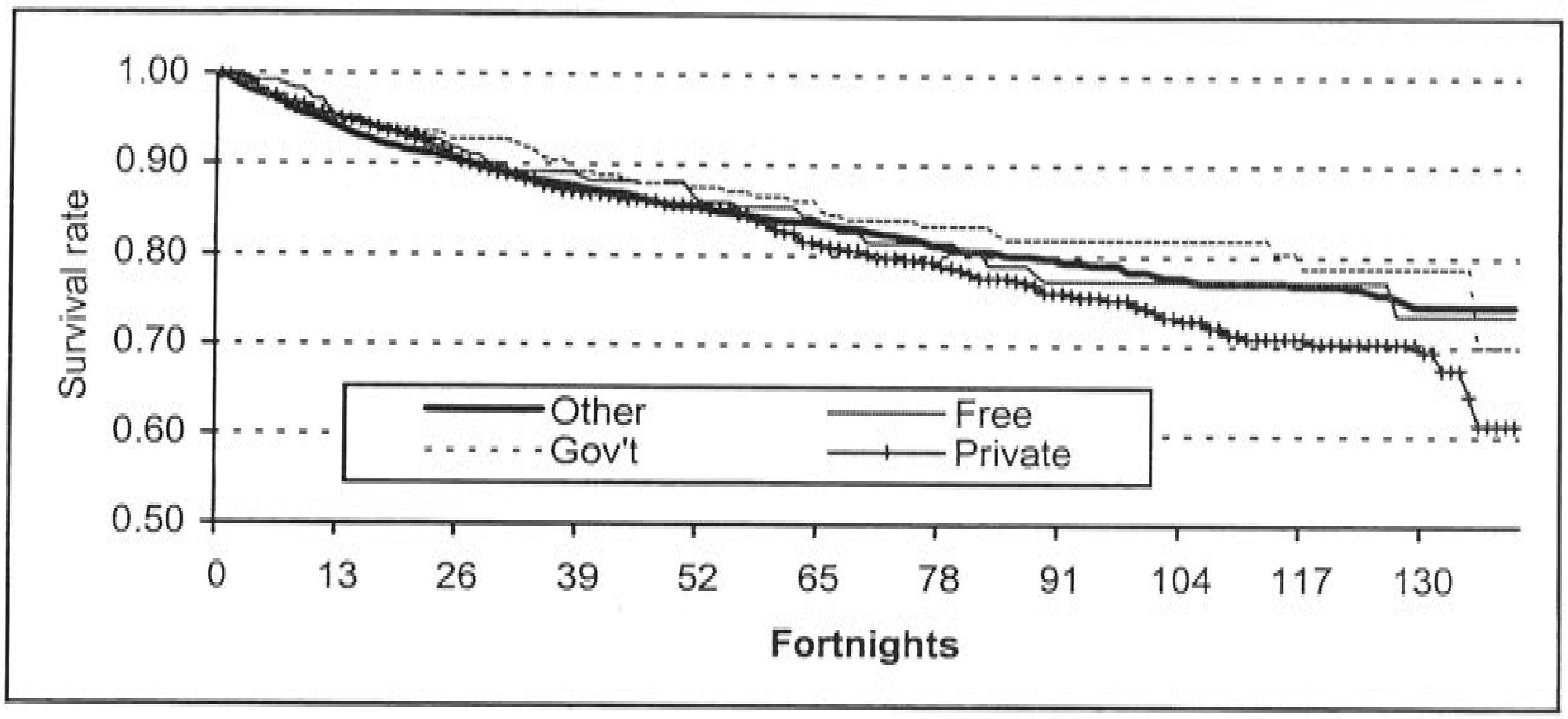


Figure 5.A12: Empirical hazard function by rent type

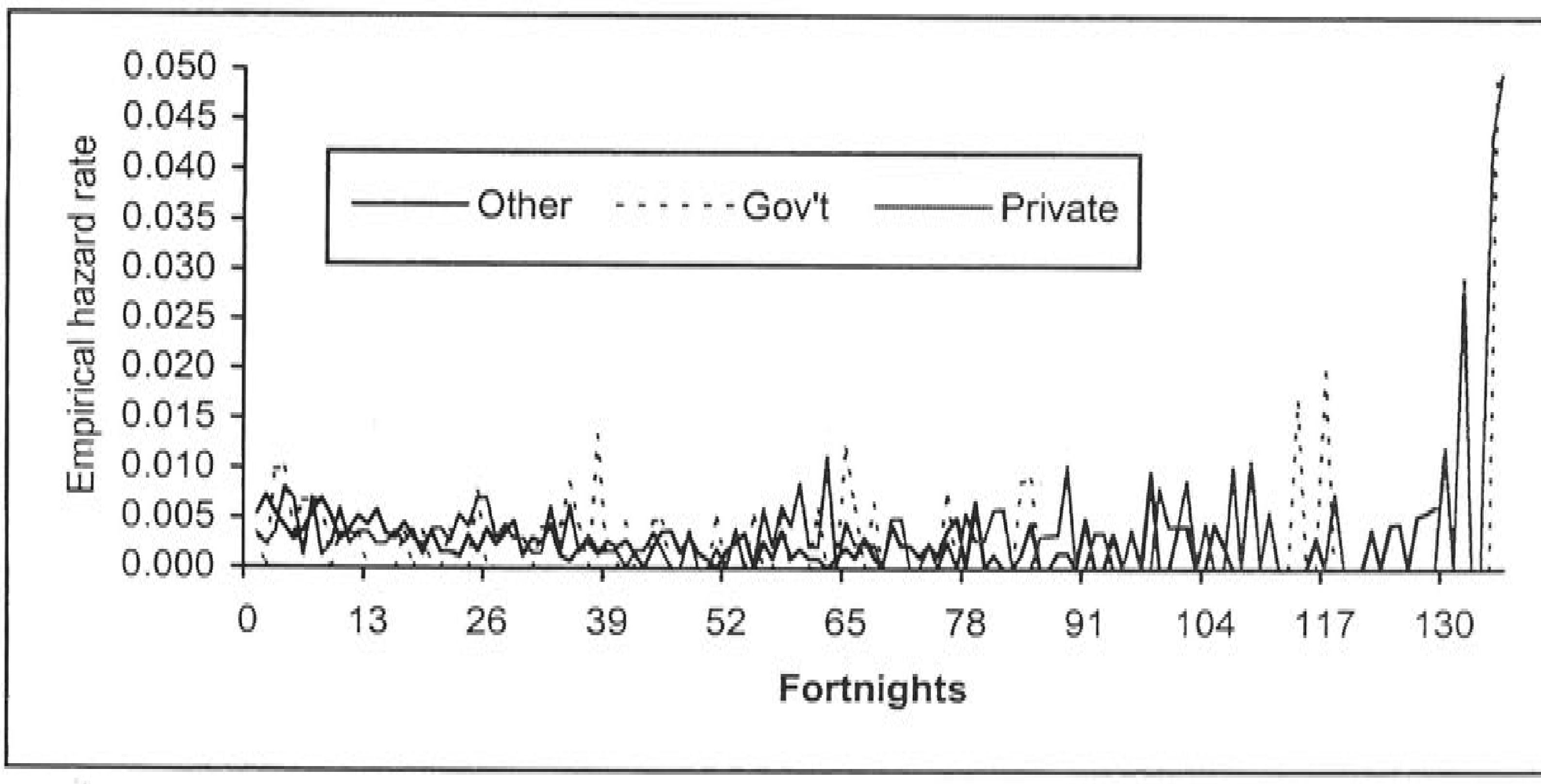


Figure 5.A13: Empirical survival function by whether having unearned income

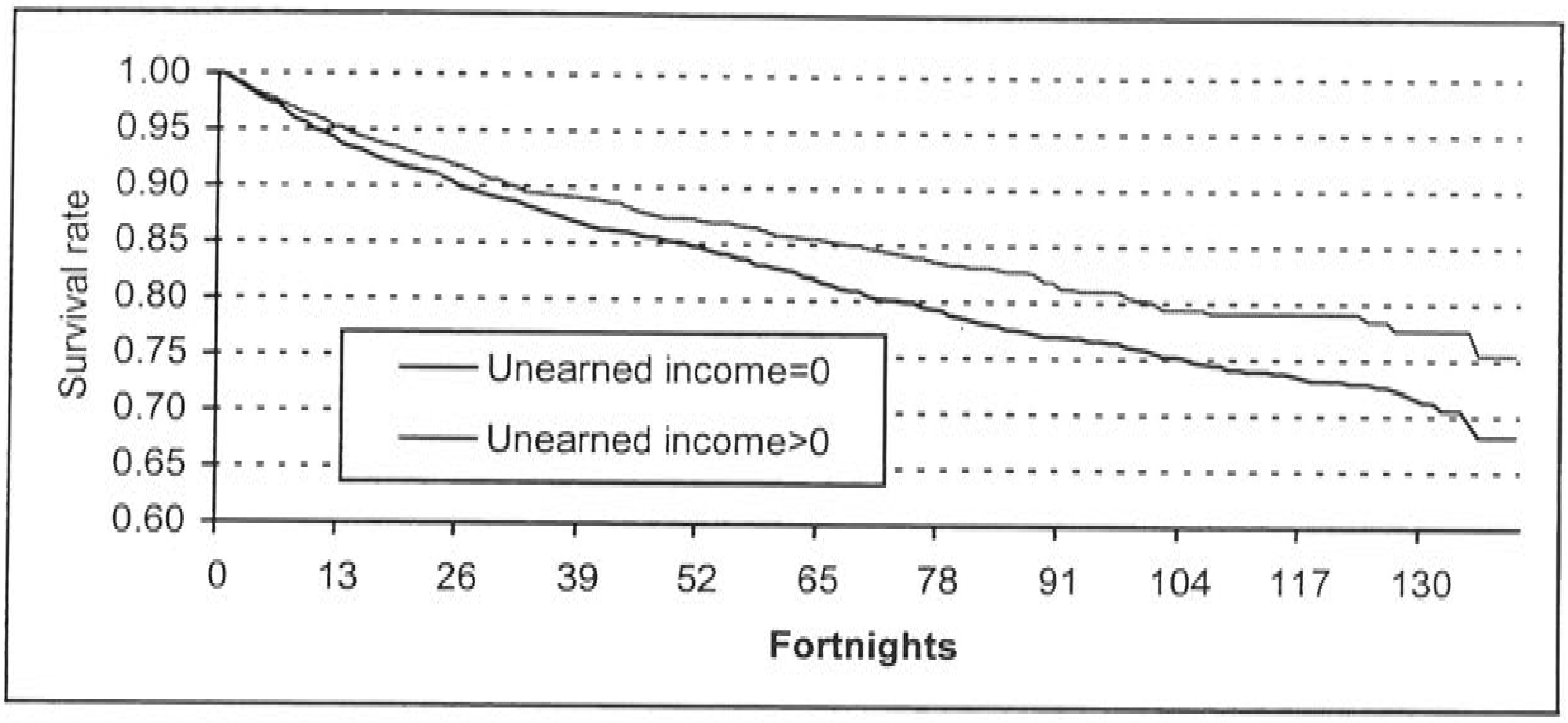


Figure 5.A14: Empirical hazard function by whether having unearned income

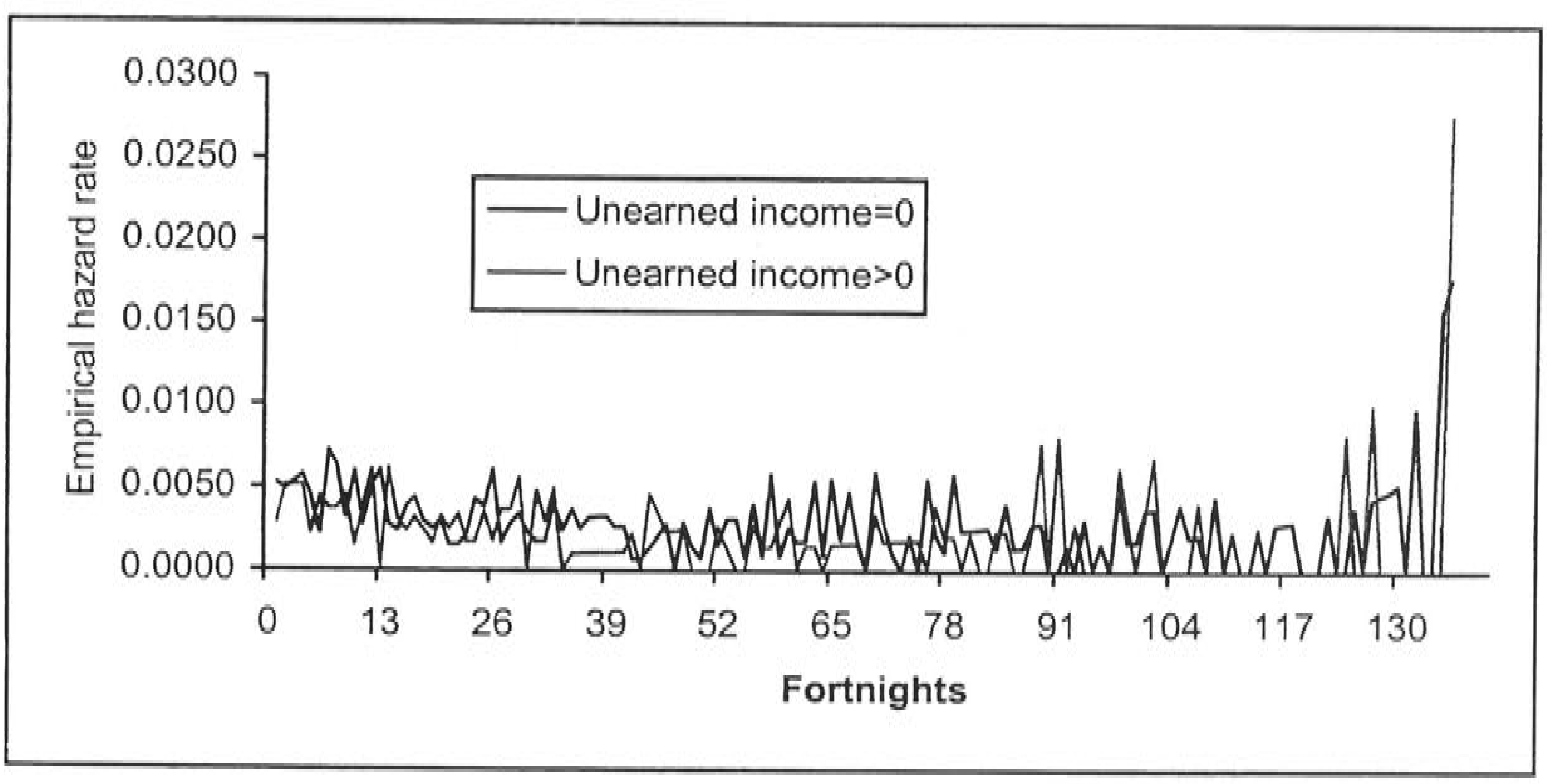


Figure 5.A15: Empirical survival function by recipient sources

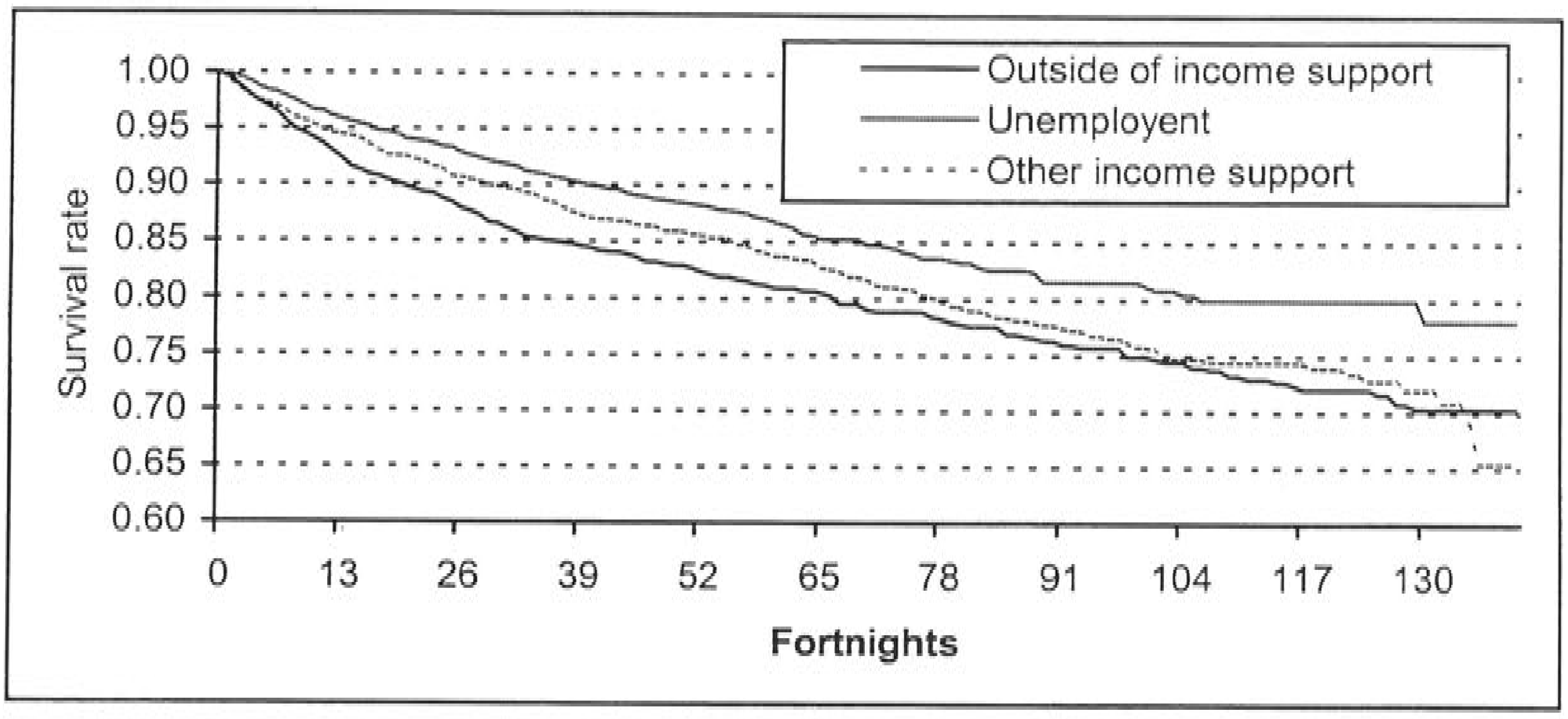


Figure 5.A16: Empirical hazard function by recipient source

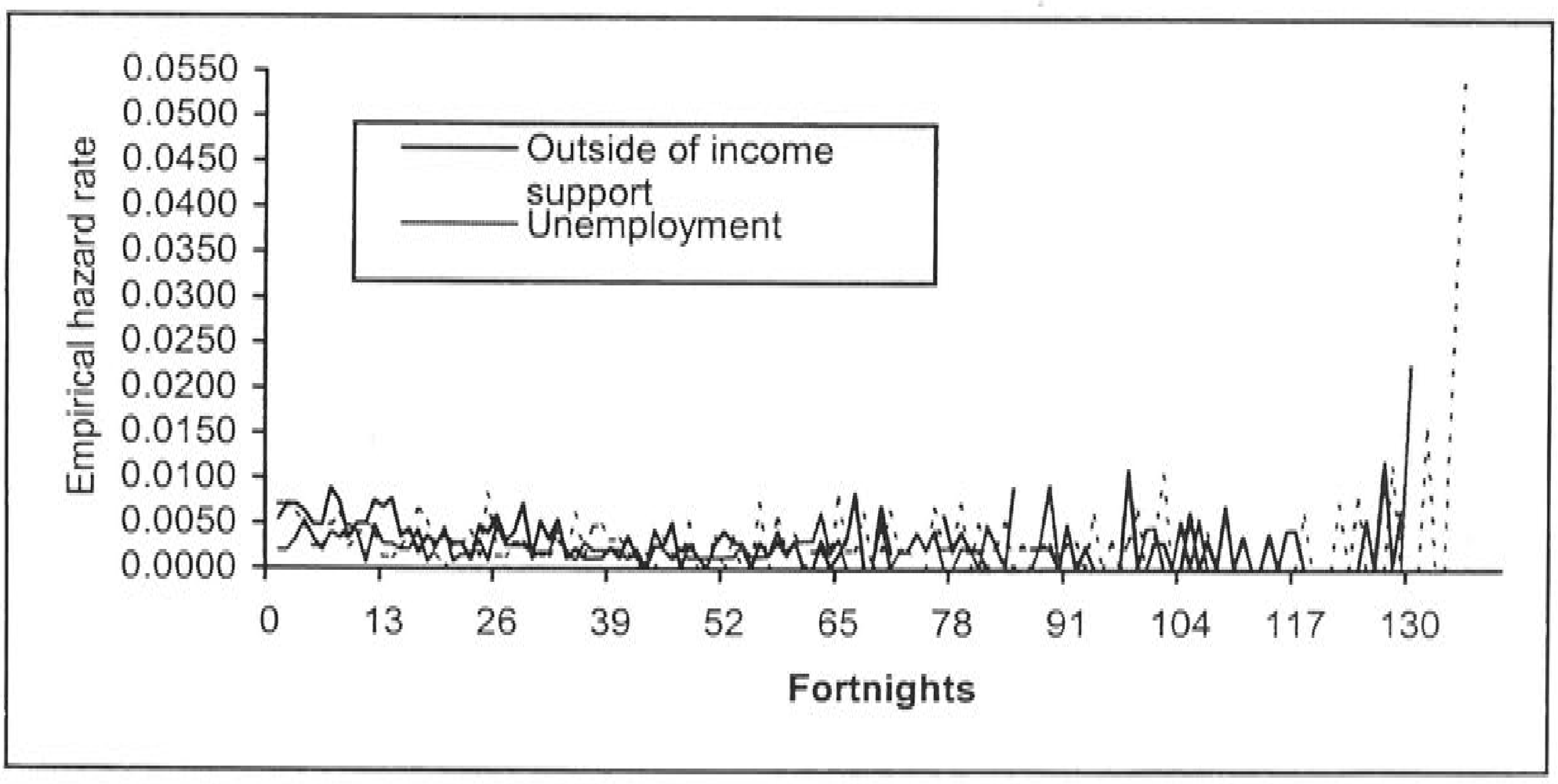


Figure 5.A17: Empirical survival function by entry cohorts

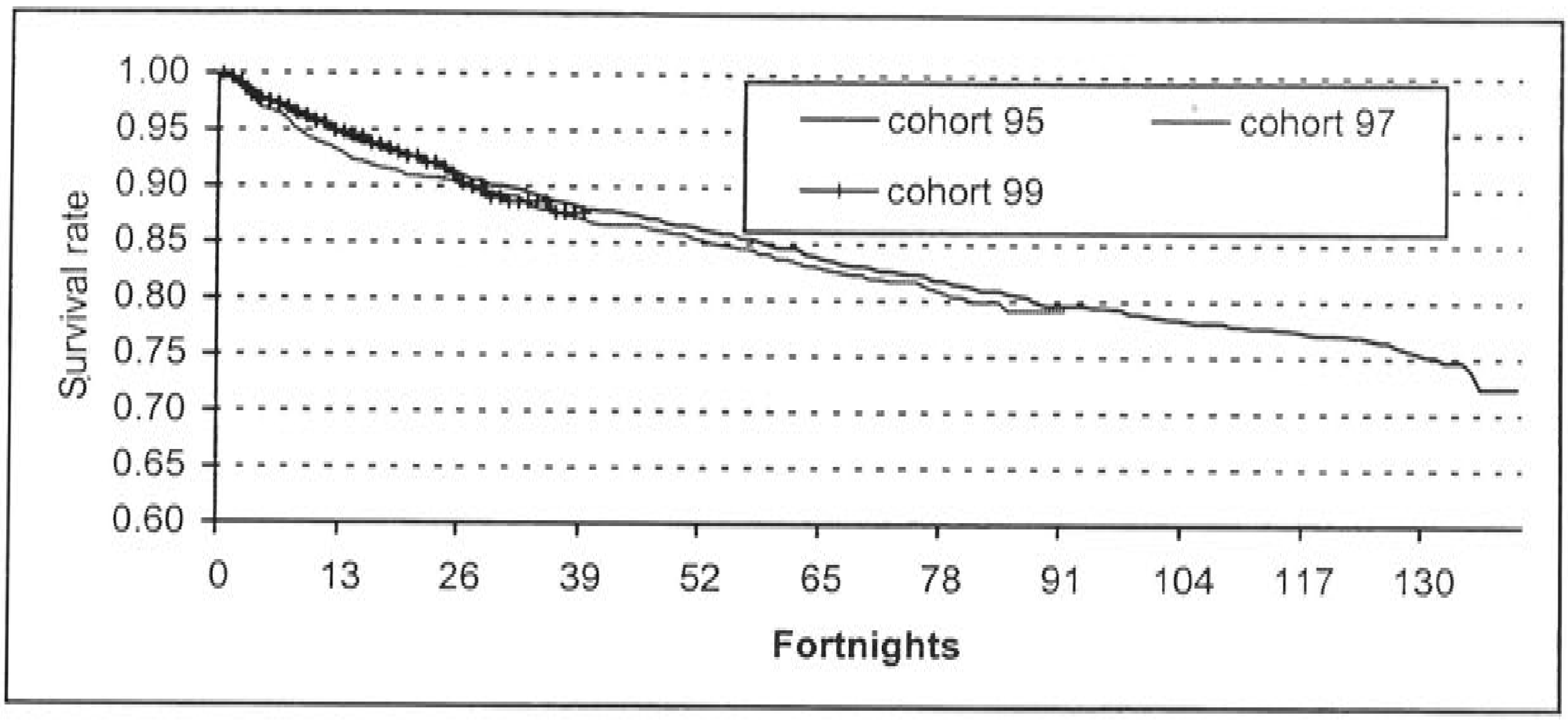
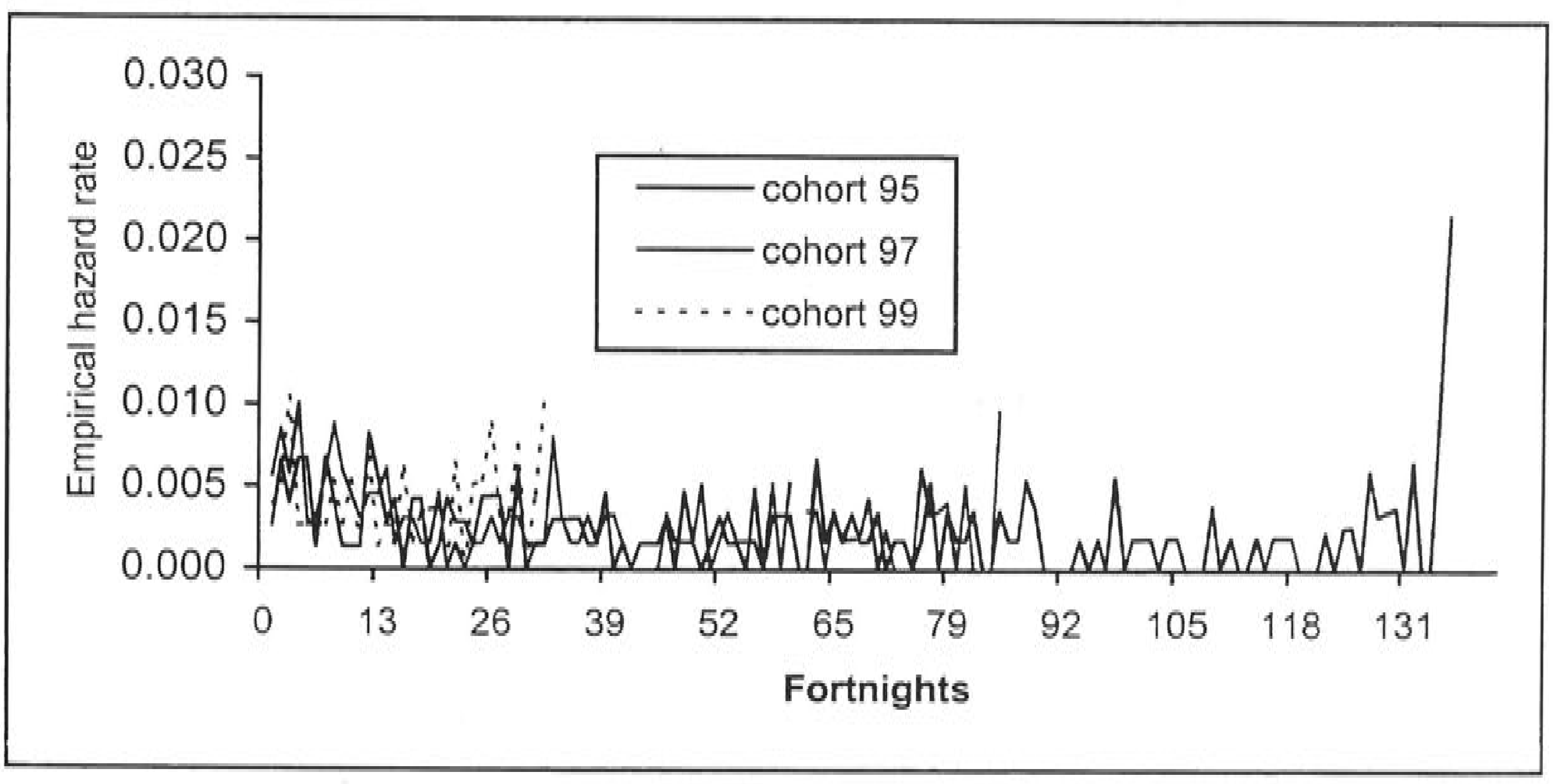


Figure 5.A18: Empirical hazard function by entry cohorts



Chapter 6

Length of Stay On the DSP Program

6.1. Introduction

As discussed earlier, the number of DSP recipients is determined not only by inflows but also by duration of recipients on the program. Unlike the unemployment benefit program, duration on DSP is normally very long; once entering into the DSP program not many recipients leave within a short period. Projections of future expenditures on the DSP program critically depend on the estimated length of stay by the recipients. Furthermore, when comparing costs for recipients with different characteristics, duration differences among them become very relevant. Taking entry age as an example, if a 20 years old new recipient is expected to stay on the program for 10 years, this person's cost is equivalent to five 60 years old new recipients if the latter are expected to stay for only two years. Policy makers may also be interested in how the length of stay varies with subgroup characteristics, such as age and gender.

However, little is currently known about the length of stay on the DSP program in Australia. The only information available is the duration distribution at the end of a financial year published by the program administrative authority[1]. Table 6.1 presents some examples of this kind of data. Although this information reveals how long the current recipients had stayed on the program up to the date when data were extracted, we still do not know how long a typical recipient will stay in the program until they leave, or how long a cohort of recipients who enter into the program in the same month (or year) will be expected to stay. In other words, the duration presented in Table 6.1 is the length of the incomplete or interrupted spells and does not reflect the

[1] Before July 1997 social security programs were administered by the Department of Social Security (DSS). DSS was subsequently restructured into the Department of Family and Community Services (FaCS).

actual length of stay[2]. The information in Table 6.1 may therefore be useful in estimating the costs already occurred, but it is less useful in projecting future program costs which are of more policy interest.

Table 6.1: Proportion of DSP recipients by incomplete duration - all recipients

	< 1 year	1 - 5 years	5-10 years	10-15 years	15-20 years	over 20 years
Jun-86	11.3	39.4	26.4	11.7	5.6	5.6
Jun-91	11.2	35.8	26.6	13.3	6.3	6.8
Jun-96	12.6	41.3	21.1	11.4	6.4	7.2
Jun-99	13	46	20	9	5	7

Source: June 1999 figures come from FaCS (1999), *Characteristics of Disability Support Pension Customers*. Figures for other years from DSS (1997) *Trends and Characteristics of Disability Payments*, Information Paper.

In other countries, especially in the US, recent papers discussing duration on disability benefit have been published. Using a random sample of Social Security beneficiaries who were first entitled to disabled-worker benefits in 1972 and were followed till January 1981, Hennessey and Dykacz (1989) estimated their final exit destinations and expected duration on benefit. First, they applied a competing risk model to their sample. They distinguished three exit destinations (or outcomes): recovery, death and retirement. In their model they related these outcomes to a set of covariates including primary diagnosis, educational level, past occupation, primary insurance amount, sex, race, and age at entitlement. Then they used the estimated parameters to project the outcomes beyond the observable period and to calculate the proportion of recipients who ultimately left the program for each reason. They projected that 11 percent of the recipients would ultimately leave the program due to recovery, 36 percent due to death, and 53 percent due to retirement at age 65. Average completed duration in the program was estimated to be 9.3 years, although considerable variations existed by entry age, sex, educational level and primary diagnosis.

Rupp and Scott (1995) used a follow-up of a 1974-82 cohort of new awardees of Supplemental Security Income (SSI) disability benefits to estimate the average stay of

[2] As will be discussed later in a steady state the duration of the completed spells can be inferred from the duration of the interrupted spells, but steady state conditions do not hold for DSP recipients.

different awardee groups. Instead of employing a formal model, as in the Hennessey and Dykacz's paper, Rupp and Scott projected the exit rate beyond the ten-year follow-up period by assuming that the exit rate after this period was only a function of age. Their estimated mean length of all the first SSI disability benefit spells was 5.5 years. It was 11.3 years for disabled children, 1.3 years for disabled adults eligible for both the Social Security Administration's Disability Insurance (SSDI) and SSI, and 6.4 years for adults eligible for SSI only. When multiple spells were accounted for, the projected mean total pre-retirement-age SSI disability stay almost doubled to 10.5 years for all awardees and increased to 26.7 years for children.

This chapter provides estimates of the duration of completed spells (referred to as 'completed duration' later) of DSP recipients in Australia based on the parameters estimated in the previous chapter. The basic idea is that, using the results in the previous chapter, the survival function can be estimated and the survival rate beyond the observable data period can be predicted. The completed duration can then be calculated using the predicted survival rate.

6.2. Completed and interrupted spells

This section first discusses the difference between completed and interrupted spells and then shows why the duration statistics published by the administrative authority are not adequate in understanding the length of stay of DSP recipients.

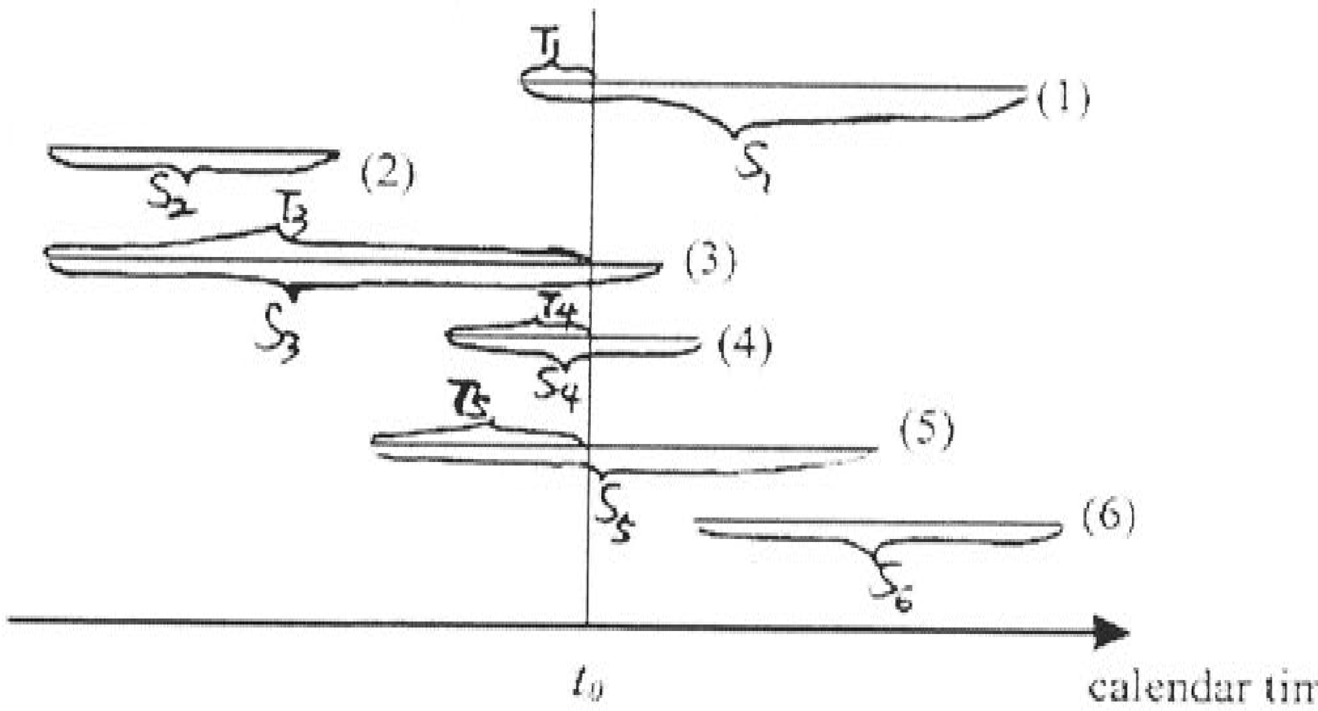
The difference between completed and interrupted spells is emphasized in the literature of unemployment duration. Figure 1, which follows Akerlof and Main (1980) and Salant (1977), illustrates the difference of these two measures in the context of DSP duration.

Suppose the duration of DSP spells is a random variable and a survey[3] about duration is conducted at time t_0. To simplify, further assume there are only six spells for six DSP recipients and only four of the six spells are in progress and surveyed at t_0. The other two spells not surveyed are either concluded before the survey or have not yet

[3] This is equivalent to an extraction of data from the FaCS LDS data.

started. The durations of the spells encountered in and up to the time of the survey (denote T_i for spell or individual i), are obviously incomplete since the spells are still in progress at t_0. T_i then is the duration or length of *an interrupted spell.* Then the length of each of the four spells until its conclusion is called the length of a *completed spell* (denote S_i^c). In life statistics, T_i represents age and S_i^c is life span of person i.

Figure 6.1: Completed and interrupted spells



Corresponding to the four surveyed spells, the following mean durations of spells can be identified:

$$\overline{T} = \sum_{i=1}^{4} T_i / 4 \text{ and } \overline{S}^c = \sum_{i=1}^{4} S_i^c / 4 \qquad (6.1)$$

The statistic $\overline{T}$, or *E(T)* in general, is the average length of the interrupted spells. In regard to unemployment, it corresponds to the official statistics on mean duration of unemployment reported by employment authorities from unemployment surveys. Obviously, the durations in Table 6.1 also measure the length of DSP interrupted spells.

Since the interrupted spell is only part of the completed spell, $\overline{T}$ (or *E(T)*) underestimates the average length of the four completed spells encountered by the survey. The average length of the four completed spells of the current recipients (captured in the survey) is represented by $\overline{S}^c$ (or $E(S^c)$ in general).

Both $\overline{T}$ (or *E(T)*) and $\overline{S}^c$ (or $E(S^c)$) are derived from the spells captured in the survey, but one more relevant statistic is the average duration of all spells ever occurring. If we denote the two spells not encountered by the survey by $S_i^{'}$, this corresponds to:

$$\overline{S} = (\sum_{i=1}^{4} S_i^c + \sum_{i=1}^{2} S_i^{'})/6 = \sum_{i=1}^{6} S_i/6, \qquad (6.2)$$

where S_i represents the length of the completed spell for person i no matter whether i is encountered or not in the survey. While $\overline{T}$ can be estimated using cross section survey data, the estimates of $\overline{S}$ and $\overline{S}^c$ need longitudinal data so that completed spells can be obtained. The period of the longitudinal data required for the task depends on the nature of the spells. In the case of DSP, the required period will be quite long.

Relationship between $\overline{T}(or E(T)), \overline{S}(or E(S))$ and $\overline{S}^c(or E(S^c))$

As noted above, the length of a completed spell captured in a survey will exceed the length of a interrupted one. In steady state, captured spells are on average halfway through their full length at the time of a survey. This is known as "interruption bias". Therefore, the average length of the interrupted spell is half the average length of the completed spell captured by the survey. The relationship between *E(T)* and *E(S)*, where S represents all spells ever occurring, is more complicated. Because of the interruption bias, T_i is an underestimate of the S_i^c captured in the survey. On the other hand, it is the spells with longer than average completed length that are more likely to be in progress at the time of a survey and then captured in the survey. This is known as "length bias". These two effects are in conflict. Which effect is dominant is determined by the exit rate (Salant 1977). Salant (1977) also shows, the following relationship holds between *E(T)* and *E(S):*

$$\frac{E(T)}{E(S)} = \frac{1}{2}\{\frac{Var(S)}{E^2(S)} + 1\} \tag{6.3}$$

if the exit rate rises with duration, $E(T)<E(S)$; if the exit rate is constant, $E(T)=E(S)$ and the effect of length-bias and interruption-bias exactly offset each other; and if the exit rate falls with duration, $E(T)>E(S)$.

6.3. Destination outcomes and duration distribution of the 1995 entry cohort

Before discussing the estimation method and results, this section documents the experience of the recipients who entered into DSP between 3 March 1995 and 31 December 1995 (the 1995 entry cohort). This cohort is followed to the end of the data set (i.e., 16 June 2000) to find out how many of them had exited (this refers to exit from DSP without transferring to the Age Pension), transferred to the Age Pension (referred to as 'retirement' later), or were still on DSP. The duration distribution of this cohort is also documented.

6.3.1. Destination outcomes and distribution of the number of spells

From the FaCS one percent sample LDS data, 763 new recipients entered into the DSP program between 3 March 1995 and 31 December 1995. Table 6.2 presents the destinations of this cohort as on 16 June 2000, the end of the data set.

Over the observable period, 16 percent of the cohort exited from DSP, 14 percent transferred to the Age Pension (or became retirement) and 70 percent were still receiving DSP benefits. Consistent with the results in the previous chapter, a larger proportion of males had left by exit and retirement than females. These destination outcomes also differed among different recipient sources. Those who transferred from unemployment benefit had the lowest proportion of leaving (including exit and retirement) and highest proportion staying on.

Table 6.2: Destinations of the 1995 entry cohort (percent)

(i). Overall (%)

	Total	Male	Female
Exit	15.73	17.45	12.25
Retirement	14.42	17.25	8.70
Still on	69.86	65.29	79.05

(ii). By recipient source (%)

	Outside of income support	From unemployment	From other payments
Exit	14.4	10.74	20.92
Retirement	19.2	10.74	9.21
Still on	66.4	78.52	69.87

Given the time limitation of the observable period, the proportion of recipients transferring to the Age Pension (or became retirement) was determined by the age composition of the new recipients. Larger proportions of males and of those who came from outside the income support system transferred to the Age Pension. This was because a larger proportion of older new recipients were males and came from outside the income support system.

Is 'churning' significant in the DSP program? From Table 6.3, it seems that the answer is no. For the 1995 entry cohort as a whole, less than 10 percent of the recipients had more than one spell and only 2.5 percent had more than two spells. However, note that, those who came from outside the income support system had the highest proportion having more than one spell (12 percent) and those who transferred from unemployment had the lowest proportion having more than one spell (5 percent)[4].

[4] As will be shown in Chapter 7, recipients who returned to work were more likely to have multi-spells than those who exited to other destinations, such as the Age Pension.

Table 6.3: Distribution of the number of spells of the 1995 entry cohort

No. of spells	Total	By recipient sources: Outside the income support	From unemployment	From other payments
1	90.56	88.00	94.63	92.05
2	6.95	9.60	2.68	5.44
3	1.83	1.87	1.34	2.09
4-7*	0.66	0.53	1.34	0.42
	100.00	100.00	100.00	100.00

* The highest number of spells for this cohort is 7.

6.3.2. Duration distribution

Due to data limitations, only a truncated distribution of this cohort can be documented. The latest entry recipients in this cohort could have more than four and less than five years completed duration. So, the duration is truncated at four years (i.e. longer than four years durations are included in the over four-year group). Another problem when looking at duration is how to deal with multi-spell recipients. There are two options: (i) look only at first spells; or (ii) look only at those with only one spell. The second option was chosen for two reasons: (i) there were not many recipients having multi spells. As shown in Table 6.3, among the 763 recipients 91 percent had one spell; (ii) for those with multi-spells, the duration of their first spells was normally short. If only first spells were used, the shorter duration spells may be over represented. In addition, to avoid the impact of transition to the Age Pension on duration, only those who entered into DSP at the age 55 or younger were considered[5]. Table 6.4 presents the duration distribution of this cohort whose entry ages were 55 or younger[6,7].

[5] From the data, among the 1995 entry cohort, no person aged 55 or younger transferred to the Age Pension over the observable period between 3 March 1995 and 16 June 2000

[6] Note that the results from Chapter 5 show that the hazard rate of the 1995 cohort is lower than the other entry cohorts.

[7] Table 6.A1 and 6.A2 in Appendix 6A presents the duration distribution for the whole cohort by entry age.

Table 6.4: Duration distribution of the 1995 entry cohort, entry age 55 or younger

(i). Overall (%)

Duration	Total	Male	Female
<=1 year	5.27	6.49	3.63
1<and<=2	3.08	3.44	2.59
2<and<=3	3.52	4.20	2.59
3<and<=4	3.52	5.73	0.52
> 4 years	84.62	80.15	90.67
	100.00	100.00	100.00

(ii). By recipient source (%)

	Outside the income support	From unemployment	From other payments
<=1 year	5.41	2.08	6.90
1<and<=2	2.70	1.04	4.60
2<and<=3	2.70	3.13	4.60
3<and<=4	2.70	4.17	4.02
> 4 years	86.49	89.58	79.89
	100.00	100.00	100.00

At least two features stand out from Table 6.4: (i) consistent with the results in the previous section most of the cohort were still on DSP at the end of the data period and therefore most of the recipients in the cohort (more than 80 percent) had durations longer than four years; (ii) the next largest proportion consisted of those with a duration of one year or less. The proportions of recipients with 1-2, 2-3, and 3-4 years of duration were smaller and similar in magnitude. This implies that the proportion of recipients who left DSP within one year were relatively high and the proportion of recipients who left after a one year period were relatively small. This is consistent with the baseline hazard rate estimation results in the previous chapter: for the less than one year period, the baseline hazard rate is relatively high and after this the baseline hazard is low and varies around a constant.

Also, for each duration interval of four years or less, males were a larger proportion than females; a larger proportion of females than males had durations of more than four years. This is consistent with the results in Chapter 5 that males had a higher hazard rate than females.

The duration distribution by recipient source shows that recipients who transferred from unemployment benefit had the lowest rate of leaving within four years. This is consistent with the results in Chapter 5. But Table 6.4 shows that recipients who transferred from other income support payments had the highest proportion leaving within a four-year duration. This result is not consistent with that in Chapter 5. There may be two reasons for this: (i) the results in Chapter 5 were derived from a very large recipient sample (including entry cohorts 1995 to 1999); and (ii) as shown in Chapter 4, the composition of recipients transferring from other income support payments in the 1995 entry cohort were quite different from other entry cohorts.

6.4. Estimation method and results

6.4.1. The Method

What is of interest is the expected, completed length of stay of DSP recipients with a certain characteristic (say entry age or gender) once they enter into the DSP program. In principle, this can be estimated by tracing an entry cohort with that characteristic through their entire into DSP recipiency experience[8]. For example, if we want to know how long a recipient who enters at age 20 will be expected to stay on the program, we can follow a cohort who started receiving this benefit at the same time and were 20 years old on entering the program up to the time when all the recipients in the cohort have left. The average duration of this cohort is the expected length of stay of a recipient who enters at age 20.

If the number of recipients in the cohort at the start is denoted as $f(0)$ and $f(x)$ represents the number of individuals remaining on the DSP program after each of x periods, where $0 \le x \le m$ and m is the maximum number of periods on DSP, then the average duration of the cohort can be written as:

[8] If the interest is in the average duration of a cohort starting their spells at a particular time, Kaits' (1970) showed that, if the continuation rate is constant and steady state conditions hold, then the average length of a cohort starting their spells in a certain year is equal to the average length of the spells ending in that same year. But obviously, for DSP recipients, none of these conditions holds.

$$S = \sum_{x=1}^{m} \frac{x(f(x-1) - f(x))}{f(0)}$$

$$= \sum_{x=0}^{m} \frac{f(x)}{f(0)}$$

$$= 1 + \sum_{x=1}^{m} s_x \,, \tag{6.4}$$

where $s_x = f(x)/f(0)$ is the survival rate just after x periods.

Therefore, from equation (6.4), the key information needed to estimate the average completed duration is the survival rate s_i. If a cohort could be followed until all recipients exited, these survival rates could be calculated directly from data. However, given that the longest data period for the DSP recipients in the LDS data set is five and a half years (January 1995 to June 2000), direct derivation of the survival rates for all periods is not possible. Therefore, the problem of estimating completed duration reduces to estimating the survival rates, especially the survival rates beyond the observable data period.

The estimation of the survival rates is based on the results in the previous chapter. In a discrete time case, the relationship between the survival function and the hazard function is[9]:

$$s_t = \exp[-\sum_{j \le t} h(j)] \,, \tag{6.5}$$

where $h(j)$ is the hazard rate in the duration interval $[j-1, j]$. Given the parameter estimates in Chapter 5, $h(j)$ can be calculated using equation (5.10)[10] for any group of recipients with characteristics X:

$$\hat{h}_i(t) = \hat{h}_0(t) \exp\{X_i' \hat{\beta}\} \,,$$

[9] This is the discrete version of equation (5.10) in Chapter 5.

[10] When conducting the calculations, the heterogeneity term θ is ignored because, as discussed in the last chapter, existence of heterogeneity is not confirmed from the model estimation.

where $\hat{h}_0$ is the baseline hazard rate estimate and $\hat{\beta}$ the vector of coefficient estimates for covariates.

In this chapter, expected duration by entry age, gender and recipient source are estimated because, as shown in the previous chapter, these factors are statistically significant in determining the hazard rate. Before reporting the estimated results, it is worth noting that the following assumptions underlie the calculations:

(a) *The baseline hazard rate for duration periods longer than the observable ones.* In the sample used to estimate the parameters in the previous chapter, the longest duration is 140 fortnights. To estimate the hazard rate and then the survival rate beyond 140 fortnights, the baseline hazard rate for longer duration periods has to be assumed. From the previous chapter, the baseline hazard estimate for durations between 104 and 140 fortnights is 0.00257. It may be reasonable to assume that durations longer than 140 fortnights have the same baseline hazard rate as 0.00257. This hazard rate is slightly smaller than the average of the baseline hazard estimates between 52 and 103 fortnights. As noted in the previous chapter the slight increase in the hazard rate after two years duration was probably due to the review of DSP recipients. Since the review normally takes place between two years and five years benefit recipiency, for those who survived the review their hazard rates should be lower than the hazard rate between 52 and 103 fortnights. Therefore, our assumption of 0.00257 per fortnight for durations longer than five years is probably not low.

(b) *The possible maximum period of DSP recipiency.* In theory, DSP duration can go to infinity. But because a recipient will normally be transferred to the Age Pension when reaching the Age Pension age, in practice DSP duration cannot become infinite. Therefore, for a DSP recipient, the maximum period (fortnights) on DSP is equal to the product of 26 (fortnights per year) multiplied by the difference between the Age Pension age and their entry age.

Since the female Age Pension age is changing, we assume two Age Pension ages for females: 60 and 65. Males' Age Pension age is 65.

6.4.2. Estimation results[11]

Three sets of results are estimated. The first shows the expected length of stay of 'a typical recipient': Australian born, single, non-home owner, other rent type, no-child, no-earned income, no-unearned income, living in ACT or NSW, entered into DSP in year 1995 and entered by transition from unemployment benefit[12]. The unemployment rate is assumed equal to 6.8, the quarterly average over the period 1995 to 1999.

The second set of results show the expected duration by entry age and gender, assuming all other covariates equal the mean values in each gender and age group cell of the sample used for duration model estimation in the previous chapter. These recipients are defined as 'mean recipients by entry age and gender'.

The third set of results show the expected duration by entry age, gender and recipient source, again, assuming all other covariates equal their mean values in each gender, age group and recipient source cell of the sample. These are 'mean recipients by entry age, gender and recipient source'. To simplify the calculations for the last two sets of results, the average entry age of each age group by gender and/or recipient source is used to calculate the maximum period. The average entry age and the maximum period by gender, and by gender and recipient source are provided in Table 6.A3 in Appendix 6A.

Of particular interest is the expected duration of a cohort that enters the program at the same time (say in the same year). Instead of calculating the expected duration for each recipient in a cohort and then calculating averages by characteristics of interest, 'mean recipients' are used to represent the cohort. This greatly simplifies the

[11] Due to the nonlinear nature of the model in the previous chapter and the procedures involved in calculating the expected duration, it is difficult to estimate the variance of expected duration. Therefore, in this chapter only the estimates of expected duration are calculated and reported.

[12] Note that the results in the previous chapter show that those who transferred from unemployment have the lowest hazard rate.

calculations, but provides similar results. The values of the variables taken by the 'mean recipients' for expected duration calculations are provided in Table 6.A3 to 6.A7 in Appendix 6A.

Table 6.5 presents the first set of results for the 'typical recipients' as defined earlier. For example, a male with the characteristics described earlier and entering into DSP at age 16, would be expected to stay on the program for 33 years. For a female entering at the same age, the expected duration would be 34 years if the female Age Pension age is 60, and 37 years if the female Age Pension age is 65. The expected duration decreases with entry age because this is the expected duration before the Age Pension age.

Table 6.5: Expected duration of 'typical recipients' and the ratio of expected duration to the time between entry age and retirement

Entry age	Expected duration (years)			Ratio of expected duration to time before retirement		
	Male	Female		Male	Female	
		a	b		a	b
16	32.7	34.0	36.9	0.67	0.77	0.75
21	20.2	23.5	25.2	0.46	0.60	0.57
31	17.3	19.0	21.0	0.51	0.66	0.62
41	15.0	14.5	17.2	0.63	0.76	0.72
51	11.0	8.0	11.9	0.79	0.89	0.85
56	7.9	3.8	8.2	0.87	0.96	0.91
60	4.6		4.7	0.92		0.95

a, Female Age Pension age is assumed 60.
b, Female Age Pension age is assumed 65.

Table 6.5 also presents the ratio of the expected duration to the time between DSP entry age and the Age Pension age for typical recipients. For example, a male 'typical recipient' with the characteristics described earlier who enters DSP at 16 years of age would be expected to spend 67 percent of his time from DSP entry to the Age Pension age on DSP. Overall, regardless of Age Pension age (60 or 65) and DSP entry age, female recipients would spend a larger proportion of their time on DSP than did male recipients. Also this ratio increases with entry age for recipients who enter after 20 years of age.

Note that these typical recipients are assumed to come from unemployment benefit. From the results in the previous chapter, those who transferred from unemployment benefit had the lowest hazard rate. Therefore for recipients coming from outside the income support system and other income support payments, the expected duration would be shorter than those who transferred from unemployment benefit (see Table 6.7).

Table 6.6 presents the second set of results for the 'mean recipient by entry age and gender'. From Table 6.6, the average expected duration of a cohort is 9-10 years. If the female Age Pension age were still at 60, on average males and females would have roughly similar expected completed durations (8.8 and 9.5 years, respectively). If the Age Pension age for females were 65 (the same as males'), females' expected completed duration would be about 3 years longer than males. This is because, other things being equal, females have a lower hazard rate than males as shown in the previous chapter. In addition, the younger the entry age, the bigger the difference of the expected duration between males and females. For the older entry ages, the impact of the Age Pension age, which provides an institutionalized leaving date, becomes significant. Also note that the impact of the female Age Pension age on female expected duration is smaller for the younger entry age groups than for the older ones. Again, for the younger age, the impact of the Age Pension age is negligible.

Table 6.6: Expected duration of 'mean recipients by entry age and gender'

Entry age	Expected duration (years)				
	Male	Female		Total*	
		a	b	a	b
16-20	21.6	26.1	27.7	23.5	24.1
21-30	12.3	15.8	16.7	13.5	13.8
31-40	11.4	13.3	14.6	12.2	12.7
41-50	10.2	9.9	12.2	10.0	11.1
51-55	8.4	5.9	9.3	7.3	8.8
56+	4.3	2.1	6.3	3.8	4.8
Average**	8.8	9.5	12.1	9.0	10.0

* Weighted average of male and female durations.

**Weighted average over age groups.

a, Female Age Pension age is assumed 60;

b, Female Age Pension age is assumed 65.

From the results in the previous chapter, the hazard rate for the age groups, 21-30, 31-40 and 41-55, is similar. If there is no the Age Pension, we would expect these three age groups to have a similar expected duration. However, due to the exogenous Age Pension age, the older the entry age, the closer to the Age Pension age and the shorter the expected duration on DSP before retirement. Therefore, although the difference in the mean values of other variables (see Table 6.A4 in Appendix 6A) among these three age groups may contribute to the difference in the estimated expected duration, the main effect should come from the Age Pension age.

For comparison, Table 6.7 presents the interrupted duration estimation as on 2 July 1999 using the FaCS one percent sample LDS data[13]. As noted earlier, these are durations of interrupted spells. The duration of interrupted spells underestimates the duration of completed spells. As noted earlier, since steady state conditions do not hold here, the completed durations do not equal twice the duration of interrupted spells and the effect of the Age Pension is a further confounding influence.

[13] Table 6.A8 in Appendix 6A presents these estimations at three other points of time. They are similar.

Table 6.7: Duration of interrupted spells as on 2 July 1999

	Average duration of interrupted spells (years)		
Age groups	Male	Female	Total
16-20	12.72	12.69	12.71
21-30	9.14	10.40	9.58
31-40	8.18	7.65	7.99
41-50	7.47	5.32	6.61
51-55	5.29	3.94	4.8
56+	3.22	2.04	2.97
Average	6.90	6.66	6.82

We learnt from the previous chapter that the hazard rate is statistically significantly different between recipient sources. Those who transferred from unemployment benefit had the lowest hazard rate and those who came from outside the income support system had the highest hazard rate. Those who transferred from other income support payments fell between. Therefore, it is worth comparing the expected duration by recipient sources.

Table 6.8 presents these estimates. It is clear that recipients who transferred from unemployment benefit had a longer expected completed duration than those from either outside the income support system or other income support payments. The difference of the expected durations between those who transferred from other income support payments and those who came from outside the income support system seems not to be significant. The previous chapter discussed why recipients from different sources might have different hazard rates. Those reasons equally apply here to explain why recipients from different sources had different expected durations, as the expected duration is determined by the hazard rate.

Table 6.8: Expected duration of 'mean recipients by entry age, gender and recipient source'

Age groups	Male	Female a	Female b	Total* a	Total* b
(a). Recipients from outside the income support system (year)					
16-20	18.9	24.3	25.7	21.1	21.7
21-30	9.4	11.0	11.3	10.0	10.1
31-40	7.5	12.3	13.3	8.9	9.2
41-50	7.9	8.6	10.3	8.1	8.8
51-55	7.4	5.5	8.6	6.6	7.9
56+	3.9	1.8	5.8	3.5	4.3
Average**	6.9	9.1	11.6	7.6	8.3
(b). Recipients who transferred from unemployment benefit					
16-20	27.7	30.7	33.3	28.9	29.9
21-30	15.6	18.0	19.2	16.3	16.7
31-40	13.6	14.9	16.6	14.0	14.6
41-50	11.8	10.8	13.5	11.4	12.5
51-55	9.0	6.1	9.9	8.0	9.3
56+	5.1	2.3	6.7	4.5	5.4
Average**	10.7	11.1	14.0	10.8	11.8
(c). Recipients who transferred from other income support payments					
16-20	22.6	23.7	25.2	23.1	23.6
21-30	11.4	15.2	16.0	13.0	13.3
31-40	9.9	12.1	13.2	11.3	11.9
41-50	9.3	9.4	11.5	9.4	10.6
51-55	8.2	5.9	9.2	6.8	8.8
56+	4.4	2.2	6.4	3.2	5.4
Average**	8.4	8.1	10.6	8.2	9.7

*Weighted average over male and female durations.

** Weighted agerage over age groups.

a, Female Age Pension age is assumed 60;

b, Female Age Pension age is assumed 65.

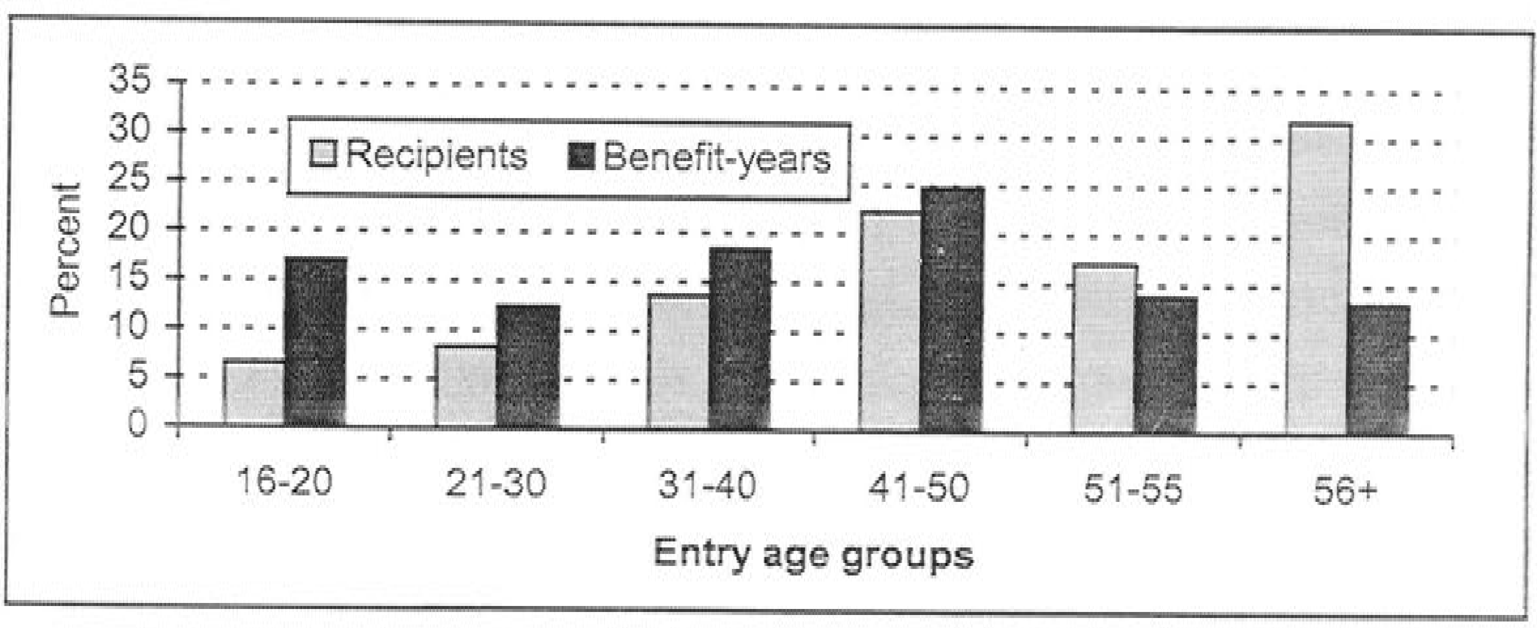
6.5. Distribution of benefit-years by entry age

Given the level of benefit, current costs of the DSP program are mainly determined by the existing number of DSP recipients. However, projection of future costs of the program requires estimation of expected completed duration of recipients as noted earlier. Another interesting and policy relevant issue is the comparative costs of individual recipients in the same entry cohort but with different characteristics, such as entry age and gender. To compare these costs, we need to know the expected completed durations of different recipients.

Because recipients with different entry ages have different expected durations, their individual contributions to the cost of the program differ. One simple way to assess the contribution to the costs of recipients by different entry ages is to look at the benefit-years of each group rather than estimating the direct cost in terms of money. Benefit-years for any entry age group is simply the product of the number of recipients in that group and their estimated expected duration.

Figure 6.2 presents the distributions of expected benefit-years and the distribution of recipients by entry age for the whole recipient sample used in Chapter 5 model estimation. Here a female retirement age of 60 is assumed in the calculations. (For the comparison by gender, see Appendix 6B.)

Figure 6.2: Comparison of distributions of recipients and benefit-years by entry age



The largest proportion of recipients was the 56 years and over age group, but their contribution to the costs of the DSP program was the second lowest because they had the shortest expected duration on DSP. In contrast, the 16-20 years old age group represented the smallest proportion of recipients, but their contribution to program costs was the third largest because they had the longest expected duration. Except for recipients whose entry age was over 50, for all the other entry age groups, their contributions to the costs of the program were greater than their representation in the entry cohort of DSP recipients.

6.6. Conclusion

By predicting the survival rate beyond the observable period, this chapter estimated the expected completed duration prior to retirement of DSP recipients. The average expected completed duration was 9-10 years for an entry cohort, but it varied with gender, entry age and recipient source. Female recipients had a longer expected duration (9.5 years if female retirement age was 60 and 12 years if female retirement age was 65) than their male counterparts (8.8 years). Recipients who transferred from unemployment had the longest expected completed duration (10.8-11.8 years depending on female retirement age), while recipients who came from outside the income support system had the shortest expected completed duration (7.6-8.3 years). Recipients who transferred from other income support payments had an average expected completed duration of 8.2-9.7 years.

The younger the entry age of the new DSP recipients, the longer was the expected completed duration. Not all recipients stayed on the program until retirement (i.e. until reaching the Age Pension age). In terms of the proportion of time spent on DSP before reaching retirement, for new recipients who entered after 20 years of age, the older the entry age, the larger the time proportion, but for those who entered at an age younger than 20, this proportion was larger than for those who entered between 21 and 30 years of age. The fact that on average new recipients only spend part of their pre-retirement time on DSP gives rise to a question: why do not all new DSP recipients stay on the DSP until retirement age and then transfer across to the Age Pension? Presumably a DSP recipient would stay on DSP benefit until the Age Pension age unless they died or recovered before that time. So death and recovery can be the reasons why not all DSP recipients stay on the program until retirement. But, the more important reason that recipients leave may be the means test nature of this benefit. Even if an individual does not recover, the benefit can still be cancelled for various reasons as will be shown in Chapter 7.

Entry age and gender are not the only characteristics that affect expected completed duration. Other important factors that might well be expected to determine this duration are the diagnosis and the seriousness of a recipient's disability. However, at present the data are not available to distinguish expected duration differences among different diagnoses. We should also expect that death exit and cancellation exit would follow different processes and are determined by different factors. If adequate termination reason data are available, it should be possible to model death termination and cancellation termination separately. This should allow an estimation of the proportion of recipients in a cohort who will ultimately exit from the program due to death and the proportion due to cancellation and retirement.

Differences in expected completed duration for recipients with different characteristics, especially entry age, suggest that a change in the composition of new recipients may change the expected completed duration of the cohort and therefore have an impact on the number of recipients. For instance, if the proportion of younger recipients increases in new recipients, the number of recipients will increase over time even the total number of the new recipients remains the same.

A final caveat is that the expected completed duration estimated here may underestimate the total length of stay of a recipient because only the expected completed duration of the first spells of DSP recipients was estimated in this chapter but some recipients had multiple spells on the DSP program.

Appendix 6A

Table 6.A1: Duration distribution of the 1995 entry cohort, the whole cohort

(a). Overall (%)

Duration	Total	Male	Female
<=1 year	7.53	9.11	4.35
1<and<=2	6.80	7.81	4.78
2<and<=3	4.78	4.99	4.35
3<and<=4	6.95	8.46	3.91
> 4 years	73.95	69.63	82.61
	100.00	100.00	100.00

(b). By recipient source (%)

	Outside of income support	From unemployment	From other income supports
<=1 year	8.48	5.67	7.27
1<and<=2	10.00	2.13	5.00
2<and<=3	5.15	3.55	5.00
3<and<=4	6.06	7.09	8.18
> 4 years	70.30	81.56	74.55
	100.00	100.00	100.00

Table 6.A2: Duration distribution of the 1995 entry cohort by entry age

Duration	16-20	21-30	31-40	41-50	51-55	56 & over
<=1 year	0.00	2.00	4.17	9.15	3.51	11.86
1<and<=2	3.23	4.00	2.08	1.22	6.14	13.98
2<and<=3	0.00	4.00	1.04	5.49	3.51	7.20
3<and<=4	3.23	2.00	5.21	3.66	2.63	13.56
> 4 years	93.55	88.00	87.50	80.49	84.21	53.39
	100.00	100.00	100.00	100.00	100.00	100.00

Table 6.A3: Mean entry age and maximum period of DSP recipiency before retirement

Age groups		Mean entry age	Retirement at 65	Retirement at 60
(a). The entire sample				
16-20	Female	17.21	1242.54	1112.54
	Male	17.01	1247.74	
21-30	Female	26.38	1004.12	874.12
	Male	25.72	1021.28	
31-40	Female	35.95	755.3	625.3
	Male	35.82	758.68	
41-50	Female	45.94	495.56	365.56
	Male	45.82	498.68	
51-55	Female	53.16	307.84	177.84
	Male	53.22	306.28	
56+	Female	57.82	186.68	56.68
	Male	59.99	130.26	
(b). Recipients from outside the income support system				
16-20	Female	16.73	1255.02	1125.02
	Male	16.46	1262.04	
21-30	Female	25.7	1021.8	891.8
	Male	26.33	1005.42	
31-40	Female	35.04	778.96	648.96
	Male	35.82	758.68	
41-50	Female	46.14	490.36	360.36
	Male	46.02	493.48	
51-55	Female	53.36	302.64	172.64
	Male	53.08	309.92	
56+	Female	58.08	179.92	49.92
	Male	60.41	119.34	

(Continue)

Table 6.A3: Mean entry age and maximum period of DSP recipiency before retirement (continued)

Age groups		Mean entry age	Retirement at 65	Retirement at 60
(c) Recipients from unemployment benefit				
16-20	Female	18.08	1219.92	1089.92
	Male	17.85	1225.9	
21-30	Female	26.45	1002.3	872.3
	Male	25.53	1026.22	
31-40	Female	36.16	749.84	619.84
	Male	35.71	761.54	
41-50	Female	45.73	501.02	371.02
	Male	45.67	502.58	
51-55	Female	53.21	306.54	176.54
	Male	53.35	302.9	
56+	Female	57.61	192.14	62.14
	Male	59.36	146.64	
(d). Recipients from other income support payments				
16-20	Female	19.2	1190.8	1060.8
	Male	19.25	1189.5	
21-30	Female	26.72	995.28	865.28
	Male	25.74	1020.76	
31-40	Female	36.02	753.48	623.48
	Male	36.09	751.66	
41-50	Female	46.06	492.44	362.44
	Male	45.93	495.82	
51-55	Female	52.96	313.04	183.04
	Male	53.1	309.4	
56+	Female	57.69	190.06	60.06
	Male	59.92	132.08	

Table 6.A4: Mean values of other variables used in calculating the expected Duration, the whole sample

	Age 16-20		Age 20-30		Age 31-40	
	Female	Male	Female	Male	Female	Male
Number of persons	98	143	102	204	209	292
Mean age at entry	17.21	17.01	26.38	25.72	35.95	35.82
Marrage status (single=1) (%)	94.9	99.3	78.43	84.8	62.68	61.99
Country of birth (Non-Australia=1) (%)	7.14	11.89	12.75	17.16	22.01	19.18
Average number of children	0.01	0.01	0.25	0.24	0.84	0.73
Average age of the youngest child	0	0.09	0.17	0.23	3.17	1.5
Homeownership(non-owner=1) (%)	100	100	94.12	95.1	78.95	81.16
Free rent (%)	30.61	40.56	11.76	10.78	6.22	5.48
Government rent (%)	5.1	1.4	7.84	8.33	17.7	12.33
Private rent (%)	11.22	7.69	43.14	40.2	43.54	42.47
Earned income>0 (%)	18.37	25.17	15.69	16.18	15.31	18.84
Average earned income($)	12.22	19.99	33.98	23.8	14.22	25.43
Unearned income>0 (%)	8.16	2.8	13.73	10.78	18.18	15.07
Average unearned income ($)	2.62	0.63	4.95	8.97	23.36	12.79
NT(=1) (%)	0	2.1	1.96	0.49	1.44	0.68
QLD(=1) (%)	20.41	20.98	14.71	24.51	19.62	24.32
SA(=1) (%)	10.2	11.89	16.67	7.84	7.18	7.53
TAS(=1) (%)	2.04	2.1	2.94	3.92	4.31	4.45
VIC(=1) (%)	27.55	19.58	31.37	25	29.67	21.92
WA(=1) (%)	8.16	7.69	1.96	8.33	7.66	7.19
Cohort 96 (=1) (%)	13.27	16.08	15.69	20.59	18.66	21.92
Cohort 97 (=1) (%)	19.39	26.57	17.65	19.12	15.79	18.49
Cohort 98 (=1) (%)	20.41	20.28	28.43	19.61	20.57	16.44
Cohort 99 (=1) (%)	28.57	25.17	15.69	20.1	23.44	19.52
From outside income support system (%)	68.37	66.43	19.61	17.65	12.44	22.26
Transition from Unem(%)	26.53	27.97	51.96	61.76	38.76	55.82
Transition from other payments (%)	5.1	5.59	28.43	20.59	48.8	21.92

(Continue)

Table 6.A4: Mean values of other variables used in calculating the expected Duration, the whole sample (continued)

	Age 41-50		Age 51-55		Age 56 & over	
	Female	Male	Female	Male	Female	Male
Number of persons	368	449	267	361	304	861
Mean age at entry	45.94	45.82	53.16	53.22	57.82	59.99
Marrage status (single=1) (%)	67.12	54.34	55.81	39.61	45.72	26.13
Country of birth (Non-Australia=1) (%)	29.35	27.62	37.08	38.23	39.47	39.37
Average number of children	0.26	0.56	0.06	0.23	0.04	0.07
Average age of the youngest child	2.38	2.47	0.88	1.34	0.44	0.54
Homeownership(non-owner=1) (%)	57.34	62.36	34.83	45.43	33.22	28.11
Free rent (%)	4.08	3.12	3.37	3.88	5.59	3.02
Government rent (%)	14.4	8.91	9.74	6.65	7.57	4.18
Private rent (%)	28.26	31.4	13.86	22.44	11.51	13.36
Earned income>0 (%)	10.6	12.25	8.24	9.7	7.89	7.2
Average earned income($)	16.53	18.33	9.61	14.16	13.41	9.4
Unearned income>0 (%)	30.43	22.05	49.06	37.95	63.49	67.02
Average unearned income ($)	24.97	20.37	35.39	39.32	67.8	68.28
NT(=1) (%)	0	0.45	0.75	0.83	0.66	0.58
QLD(=1) (%)	17.12	23.16	19.48	18.56	16.45	17.42
SA(=1) (%)	7.07	8.46	8.24	8.59	9.87	10.69
TAS(=1) (%)	4.62	4.9	3	2.22	3.62	1.97
VIC(=1) (%)	26.63	20.04	21.35	25.76	22.7	24.85
WA(=1) (%)	10.33	7.57	10.49	8.03	11.18	8.71
Cohort 96 (=1) (%)	17.39	17.82	17.23	20.78	19.08	21.72
Cohort 97 (=1) (%)	19.02	18.04	20.97	20.78	22.37	18.23
Cohort 98 (=1) (%)	20.92	18.49	22.85	18.28	21.38	16.96
Cohort 99 (=1) (%)	22.28	21.38	18.35	21.33	25	19.28
From outside income support system (%)	21.2	28.73	27.72	31.86	38.49	53.66
Transition from Unem(%)	41.58	51.67	34.08	50.69	25.33	34.61
Transition from other payments (%)	37.23	19.6	38.2	17.45	36.18	11.73

Table 6.A5: Mean values of other variables used in calculating the expected Duration, recipients from outside the income support system

	Age 16-20		Age 20-30		Age 31-40	
	Female	Male	Female	Male	Female	Male
Number of persons	67	95	20	36	26	65
Mean age at entry	16.73	16.46	25.7	26.33	35.04	35.82
Marrage status (single=1) (%)	95.52	100	65	69.44	50	49.23
Country of birth (Non-Australia=1) (%)	8.96	10.53	5	25	30.77	16.92
Average number of children	0	0	0.3	0.5	0.38	0.89
Average age of the youngest child	0	0	0.45	0.47	1.81	2.43
Homeownership(non-owner=1) (%)	100	100	85	91.67	69.23	69.23
Free rent (%)	38.81	50.53	15	19.44	7.69	3.08
Government rent (%)	4.48	0	0	8.33	3.85	7.69
Private rent (%)	5.97	1.05	35	33.33	42.31	40
Earned income>0 (%)	20.9	27.37	20	16.67	11.54	27.69
Average earned income($)	10.6	20.15	70.49	40.7	3.44	59.94
Unearned income>0 (%)	11.94	3.16	25	19.44	46.15	27.69
Average unearned income ($)	3.74	0.78	12.39	18.91	99.14	29.74
NT(=1) (%)	0	1.05	0	0	0	1.54
QLD(=1) (%)	20.9	23.16	30	30.56	15.38	29.23
SA(=1) (%)	11.94	7.37	15	5.56	0	6.15
TAS(=1) (%)	1.49	2.11	0	2.76	7.69	6.15
VIC(=1) (%)	28.36	22.11	30	27.58	73.08	21.54
WA(=1) (%)	8.96	6.32	5	8.33	3.85	6.15
Cohort 96 (=1) (%)	16.42	18.95	5	13.89	19.23	23.08
Cohort 97 (=1) (%)	19.4	25.26	10	11.11	7.69	13.85
Cohort 98 (=1) (%)	20.9	21.05	25	5.56	7.69	7.69
Cohort 99 (=1) (%)	2.88	25.26	10	8.33	7.69	6.15

(Continue)

Table 6.A5: Mean values of other variables used in calculating the expected Duration, recipients from outside the income support system (continued)

	Age 41-50		Age 51-55		Age 56 & over	
	Female	Male	Female	Male	Female	Male
Number of persons	78	129	74	115	117	462
Mean age at entry	46.14	46.02	53.36	53.08	58.08	60.41
Marrage status (single=1) (%)	46.15	37.98	27.03	22.61	25.64	18.4
Country of birth (Non-Australia=1) (%)	24.36	25.58	35.14	34.78	42.74	38.74
Average number of children	0.1	0.65	0.03	0.32	0.01	0.05
Average age of the youngest child	0.97	3.15	0.31	1.85	0.11	0.43
Homeownership (non-owner=1) (%)	51.28	51.16	28.38	36.52	15.38	24.89
Free rent (%)	2.56	2.33	2.7	2.61	0.85	3.46
Government rent (%)	7.69	6.2	2.7	3.48	1.71	2.6
Private rent (%)	25.64	22.48	17.57	18.26	5.13	7.79
Earned income>0 (%)	11.54	17.83	9.46	8.7	10.26	8.44
Average earned income($)	26.42	33.45	7.1	15.67	18.23	13.14
Unearned income>0 (%)	48.72	37.98	68.92	56.52	77.78	77.71
Average unearned income ($)	55.03	53.51	72.5	92.03	109.63	97.03
NT(=1) (%)	0	0.78	0	1.74	0	0.43
QLD(=1) (%)	28.21	20.16	14.86	16.52	11.97	16.02
SA(=1) (%)	10.26	13.18	10.81	7.83	11.11	10.82
TAS(=1) (%)	5.13	7.75	4.05	1.74	3.42	2.6
VIC(=1) (%)	19.23	21.71	27.03	27.83	23.08	24.24
WA(=1) (%)	8.97	7.75	5.41	6.96	11.11	8.66
Cohort 96 (=1) (%)	14.1	21.71	14.86	18.26	23.93	22.29
Cohort 97 (=1) (%)	12.82	16.28	17.57	20	19.66	16.45
Cohort 98 (=1) (%)	14.1	11.63	21.62	24.35	24.79	15.58
Cohort 99 (=1) (%)	17.95	13.95	17.57	15.65	17.09	16.88

Table 6.A6: Mean values of other variables used in calculating the expected Duration, recipients from unemployment benefit

	Age 16-20		Age 20-30		Age 31-40	
	Female	Male	Female	Male	Female	Male
Number of persons	26	40	53	126	81	163
Mean age at entry	18.08	17.85	26.45	25.53	36.16	35.71
Marrage status (single=1) (%)	96.15	97.5	88.68	89.68	79.01	66.87
Country of birth (Non-Australia=1) (%)	3.85	12.5	9.43	17.46	20.99	18.4
Average number of children	0	0.025	0.019	0.2	0.36	0.65
Average age of the youngest child	0	0.33	0.02	0.21	1.74	1.32
Homeownership (non-owner=1) (%)	100	100	100	96.03	88.89	85.89
Free rent (%)	15.38	20	15.09	7.94	6.17	5.52
Government rent (%)	3.85	2.5	9.43	9.52	14.81	12.88
Private rent (%)	15.38	25	41.51	41.27	50.62	44.17
Earned income>0 (%)	7.69	20	15.09	15.87	14.81	16.56
Average earned income($)	13.15	14.37	34.54	24.19	8.56	13.22
Unearned income>0 (%)	0	2.5	9.43	8.73	11.11	11.66
Average unearned income ($)	0.23	0.36	2.99	5.93	5.36	7.21
NT(=1) (%)	0	2.5	3.77	0.79	2.47	0
QLD(=1) (%)	15.38	17.5	13.21	20.63	17.28	25.15
SA(=1) (%)	3.85	20	9.43	9.62	9.88	7.98
TAS(=1) (%)	3.85	2.5	0	4.76	1.23	3.68
VIC(=1) (%)	30.77	10	39.62	27.78	29.63	20.86
WA(=1) (%)	3.85	12.5	1.89	7.14	8.64	7.36
Cohort 96 (=1) (%)	3.85	5	13.21	15.87	12.35	13.5
Cohort 97 (=1) (%)	19.23	35	18.87	23.81	20.99	22.7
Cohort 98 (=1) (%)	19.23	22	39.62	27.78	32.1	23.93
Cohort 99 (=1) (%)	46.15	30	22.64	29.37	30.86	30.06

(Continue)

Table 6.A6: Mean values of other variables used in calculating the expected Duration, recipients from unemployment benefit (continued)

	Age 41-50		Age 51-55		Age 56 & over	
	Female	Male	Female	Male	Female	Male
Number of persons	153	232	91	183	77	298
Mean age at entry	45.73	45.67	53.21	53.35	57.61	59.36
Marrage status (single=1) (%)	81.7	62.5	79.12	49.18	72.73	34.9
Country of birth (Non-Australia=1) (%)	27.45	28.45	36.26	37.16	40.26	37.25
Average number of children	0.12	0.56	0.01	0.14	0.01	0.09
Average age of the youngest child	1.16	2.23	0.13	1.11	0.22	0.77
Homeownership (non-owner=1) (%)	63.4	69.4	42.86	51.91	46.75	30.54
Free rent (%)	4.58	2.59	4.4	4.37	5.19	2.68
Government rent (%)	17.65	11.64	16.48	8.74	18.18	5.37
Private rent (%)	30.07	24.91	10.99	24.59	12.99	18.46
Earned income>0 (%)	8.5	10.78	8.79	8.2	9.09	4.7
Average earned income($)	10.57	13.1	13.78	12.88	17.01	5.73
Unearned income>0 (%)	18.3	15.09	38.46	26.78	45.45	56.38
Average unearned income ($)	13.04	7.05	21.56	9.81	36.55	37.01
NT(=1) (%)	0	0.43	0	0.55	0	1.01
QLD(=1) (%)	17.65	23.71	15.33	16.94	10.39	17.45
SA(=1) (%)	5.23	7.33	9.89	10.93	15.58	10.07
TAS(=1) (%)	5.23	4.31	2.2	2.19	5.19	1.01
VIC(=1) (%)	30.72	20.26	19.78	25.14	20.78	25.5
WA(=1) (%)	7.84	7.33	13.19	7.1	14.29	9.06
Cohort 96 (=1) (%)	13.07	13.36	12.09	16.39	12.99	18.46
Cohort 97 (=1) (%)	20.92	19.83	19.78	24.59	19.48	23.15
Cohort 98 (=1) (%)	28.1	25.43	30.77	19.13	25.97	20.13
Cohort 99 (=1) (%)	31.37	30.17	21.98	28.42	33.77	24.83

Table 6.A7: Mean values of other variables used in calculating the expected duration, recipients from other income support payments

	Age 16-20		Age 20-30		Age 31-40	
	Female	Male	Female	Male	Female	Male
Number of persons	5	8	29	42	102	64
Mean age at entry	19.2	19.25	26.72	25.74	36.02	36.09
Marrage status (single=1) (%)	80	100	68.97	83.33	52.94	62.5
Country of birth (Non-Australia=1) (%)	0	25	24.14	9.52	20.59	23.44
Average number of children	0.2	0	0.62	0.14	1.33	0.76
Average age of the youngest child	0	0	0.28	0.07	4.67	1.02
Homeownership (non-owner=1) (%)	100	100	89.66	95.24	73.53	81.25
Free rent (%)	0	25	3.45	11.9	5.88	7.81
Government rent (%)	20	12.5	10.34	4.76	23.53	15.63
Private rent (%)	60	0	51.72	42.86	38.24	40.63
Earned income>0 (%)	40	25	13.79	16.67	16.67	15.63
Average earned income($)	28.99	46.28	7.78	8.16	21.45	21.5
Unearned income>0 (%)	0	0	13.79	9.52	16.67	10.94
Average unearned income ($)	0	0.2	3.4	9.59	18.34	9.79
NT(=1) (%)	0	12.5	0	0	0.98	1.56
QLD(=1) (%)	40	12.5	6.9	30.95	22.55	17.19
SA(=1) (%)	20	25	31.03	4.76	6.86	7.81
TAS(=1) (%)	0	0	10.34	2.38	5.89	4.69
VIC(=1) (%)	0	37.5	17.24	14.29	18.63	25
WA(=1) (%)	20	0	0	11.9	7.84	7.81
Cohort 96 (=1) (%)	20	37.5	27.59	40.48	23.53	42.19
Cohort 97 (=1) (%)	20	0	20.69	11.9	13.73	12.5
Cohort 98 (=1) (%)	20	0	10.34	7.14	14.71	6.25
Cohort 99 (=1) (%)	0	0	6.9	2.38	21.57	6.25

(Continue)

Table 6.A7: Mean values of other variables used in calculating the expected Duration, recipients from other income support payments (continued)

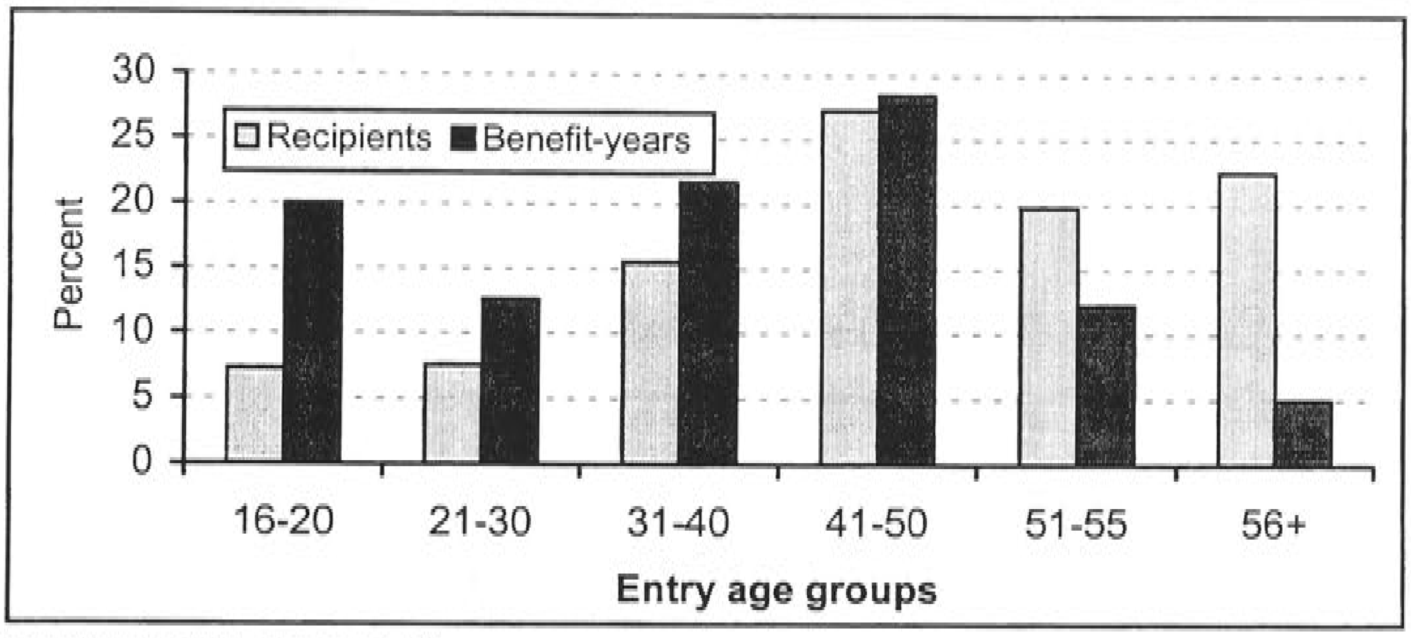
	Age 41-50		Age 51-55		Age 56 & over	
	Female	Male	Female	Male	Female	Male
Number of persons	137	88	102	63	110	101
Mean age at entry	46.06	45.93	52.96	53.1	57.69	59.92
Marrage status (single=1) (%)	62.77	56.82	55.88	42.86	48.18	35.64
Country of birth (Non-Australia=1) (%)	34.31	28.41	39.22	47.62	35.45	48.51
Average number of children	0.51	0.43	0.14	0.3	0.09	0.07
Average age of the youngest child	4.55	2.1	1.97	1.05	0.95	0.41
Homeownership (non-owner=1) (%)	54.01	60.23	32.35	42.86	42.73	35.64
Free rent (%)	4.38	5.68	2.94	4.76	10.91	1.98
Government rent (%)	14.6	5.68	8.82	6.35	6.36	7.92
Private rent (%)	27.74	35.23	13.73	23.81	17.27	23.76
Earned income>0 (%)	12.41	7.95	6.86	15.87	4.55	8.91
Average earned income($)	17.55	9.98	7.71	15.09	5.76	3.16
Unearned income>0 (%)	33.58	17.05	44.12	36.51	60.91	49.5
Average unearned income ($)	21.19	6.91	20.81	28.8	45.18	29.03
NT(=1) (%)	0	0	1.96	0	1.82	0
QLD(=1) (%)	10.22	26.14	26.47	26.98	25.45	23.76
SA(=1) (%)	7.3	4.55	4.9	3.17	4.55	11.88
TAS(=1) (%)	3.65	2.27	2.94	3.17	2.73	1.98
VIC(=1) (%)	26.28	17.05	18.63	23.81	23.64	25.74
WA(=1) (%)	13.87	7.95	11.76	12.7	9.09	7.92
Cohort 96 (=1) (%)	24.09	23.86	23.53	38.1	18.18	28.71
Cohort 97 (=1) (%)	20.44	15.91	24.51	11.11	27.27	11.88
Cohort 98 (=1) (%)	16.79	10.23	16.67	4.76	14.55	13.86
Cohort 99 (=1) (%)	14.6	9.09	15.69	11.11	27.27	13.86

Table 6.A8: Duration of interrupted spells (years)

	Male	Female	Total
On 5 July 1996			
16-20	12.45	12.38	12.42
21-30	8.92	10.81	9.59
31-40	7.69	7.55	7.64
41-50	7.41	5.11	6.58
51-55	5.07	3.08	4.46
56+	2.90	1.69	2.75
Average	6.45	6.74	6.54
On 4 July 1997			
16-20	12.66	12.80	12.72
21-30	8.90	10.78	9.54
31-40	7.94	7.82	7.9
41-50	7.35	5.15	6.53
51-55	5.05	3.33	4.48
56+	3.01	1.67	2.81
Average	6.60	6.75	6.64
On 3 July 1998			
16-20	12.39	12.73	12.54
21-30	8.88	10.31	9.38
31-40	7.93	8.10	7.99
41-50	7.58	5.16	6.62
51-55	5.20	3.72	4.67
56+	3.11	1.87	2.86
Average	6.75	6.63	6.71

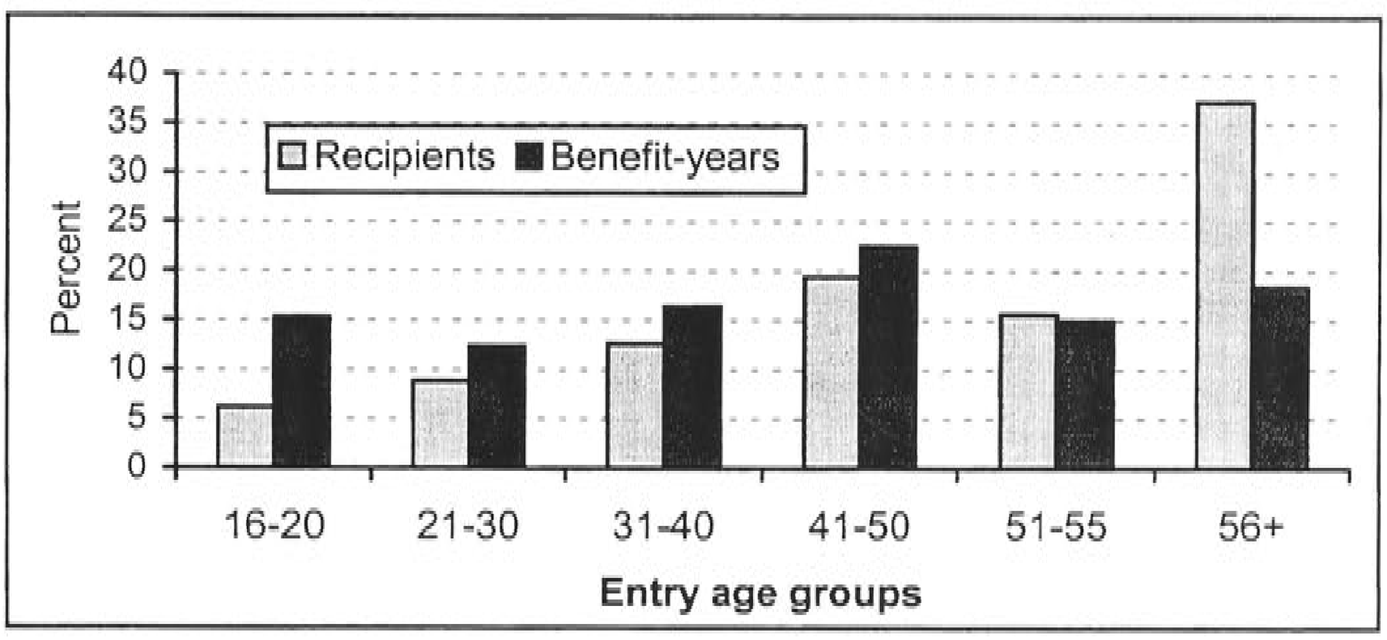
Appendix 6B

Figure 6.A1: Comparison of distributions of recipients and benefit-years by entry age, female



*Female retirement is assumed 60.

Figure 6.A2: Comparison of distributions of recipients and benefit-years by entry age, male



Chapter 7

DSP Exits—Where Do They Go?

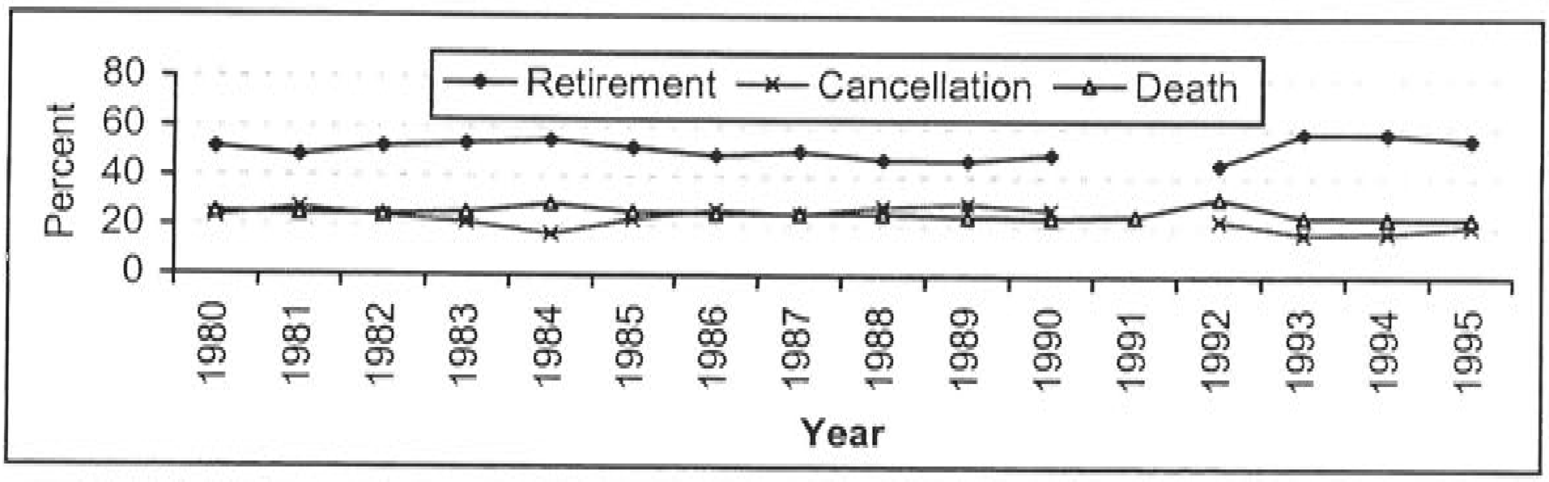
7.1. Introduction

To fully understand the dynamics of DSP recipients, we need to know where they come from (Chapter 4), how long they stay on the program (Chapter 5 and 6), where they go if they leave, i.e. their exit destinations, and what individual characteristics determine their exit destinations. The best way to answer questions about the determination of exit destinations would be to follow an entry cohort and know the exit destinations of all recipients in this cohort. Unfortunately, such data is not available. From the data that is available, only the exit destinations for recipients who have left DSP during a specific time period are known. But, at least for those recipients who have left DSP, it is possible with these data to learn whether recipients who have exited to different destinations have different characteristics. This chapter addresses questions related to exit destinations.

Once a disabled person is granted a DSP benefit, there are three main reasons for termination: transfer to the Age Pension (referred to as "retirement" later), death, and benefit cancellation. Benefit cancellation includes all those who leave not through retirement or death. Most terminations take place through retirement or moving on to the Age Pension. For example, of DSP recipients who exited in the financial year 1998-99, 57 percent transferred to the Age Pension, 19 percent died and 24 percent were cancelled for various reasons (FaCS, 1999). The patterns of termination are similar over time (see Figure 7.1).

One of the problems with the above division of exit destinations by the administrative authority is that we do not know whether those who left due to cancellation recovered and returned to work or were just cancelled because of the means test requirements of DSP benefits. This differentiation is important from a policy point of view. In addition, returning to work is more likely to be based on individual choice, while means tested cancellations can be regarded as forced termination.

Figure 7.1: Proportion of DSP recipients who left to different destinations, 1980 to 1995



Source: DSS [1997]. *Trends and characteristics of disability payments*, Information paper.

This chapter uses three different FaCS data sets to focus on exit: to distinguish those who returned to work and to examine whether those who returned to work were different from those who left due to other reasons. The findings show that recipients who exited to different destinations possessed different characteristics.

7.2. The data and the method to distinguish those who returned to work

One data set at FaCS, which can be used to identify DSP recipients who returned to work, is available for the period 8 May 1998 to 25 February 2000. Among the coded termination reasons in this data set[1], four reasons can be regarded as returning to work: EAN (cancelled due to earnings), FTW (return to work—notify by 14 days), RTW (return to work) and CLR (cancelled by clients request). While treating CLR as a return to work is based on the assumption that only those recipients who returned to work would like to withdraw from DSP voluntarily, for the other three cases, the reason is obvious. This data set contains no other information about recipients so it was matched with the FaCS one percent sample LDS data and another data set containing disability type information for DSP recipients who received DSP benefits

[1] See Table 7.A1 in Appendix 7A for details of termination reason codes and definitions.

during the period 3 July 1998 to 10 September 1999. These three data sets enable four exit destinations - retirement, death, returning to work and other cancellation – to be combined with the characteristics of recipients who had exited to different destinations[2].

The termination reason data set and the disability type data set cover different time periods. To utilize the termination reason and disability information, a period covered by both data sets must be chosen. The period chosen was 3 July 1998 to 25 February 2000. The reasons for choosing this period and a detailed descriptions on the derivation of the recipient sample are provided in Appendix 7A. Roughly speaking, the sample included those recipients who exited DSP during the period 3 July 1998 to 25 February. Over this period, 801 persons[3] exited the DSP program with identifiable reasons and disability types. Of these just over 55 percent transferred to the Age Pension, 11 percent left due to death[4], 9 percent returned to work based on the definition above and 24 percent were cancelled for other reasons. The characteristics of these recipients will be discussed in the next section.

7.3. Difference among recipients who exited to different destinations

This section examines the characteristics of recipients who exited DSP to different destinations. Table 7.1 presents descriptive statistics on the recipients by exit destinations. A subset of variables which appear to have different means across recipients who exited to different destinations is briefly discussed. Because those who

[2] Retirement is identified by combining the information in the FaCS one percent LDS data and the termination reason data, as discussed in Appendix 7A. Death can be directly identified because there is a death code in the data. Except for disabilities and termination reasons, all other information is from the FaCS one percent LDS sample data.

[3] The units of analysis are persons rather than spells. If multi-spells occur, the exit destination is determined by the destination of the last spell. Multi-spells occur when there is more than 2 fortnights break in benefit recipiency.

[4] The sample data does not exactly replicate the aggregate published data. Termination due to death is lower than the published figures, while termination due to cancellation is higher. This difference may result from the sampling error involved in selecting the sample.

returned to work are the most interesting group of people, variables for other exit destination recipients are compared with this group.

Table 7.1: Summary statistics of DSP recipients who left DSP by exit destination

	All persons	Retirement	Return work	Other cancellation	Death
Number of persons	801	443	75	196	87
Demographic characteristics					
Male	0.7054	0.7427	0.6533	0.6480	0.6897
Entry age	50.34	56.46	34.90	43.97	46.84
	(11.88)	(6.34)	(13.53)	(12.25)	(10.09)
Male	51.76	57.44	35.35	44.86	48.59
	(11.73)	(5.80)	(14.90)	(12.53)	(9.87)
Female	46.96	53.65	34.05	42.33	42.96
	(11.56)	(7.00)	(10.70)	(11.64)	(9.66)
Marriage status__couple	0.5518	0.6682	0.2800	0.4796	0.3563
Australian born	0.6729	0.5779	0.7600	0.8112	0.7701
Proportion having children	0.0899	0.0406	0.1467	0.1786	0.092
Number of children	1.81	1.28	1.82	2.09	1.75
	(0.97)	(0.67)	(0.87)	(1.07)	(0.89)
Age of the youngest child	9.33	11.94	7.73	8.29	10.25
	(4.52)	(3.54)	(4.67)	(4.46)	(4.59)
Home ownership and rent type					
Home owner	0.5069	0.6456	0.2800	0.3878	0.2644
Government rent	0.0836	0.088	0.0533	0.0663	0.1264
Private rent	0.211	0.1309	0.2667	0.3316	0.2989
Free rent	0.0712	0.0609	0.1200	0.0663	0.092
Other rental	0.6342	0.7201	0.5600	0.5357	0.4828
Disability types					
Cancer/Tumor	0.0637	0.0316	0.0400	0.0918	0.1839
Circulatory System	0.0924	0.1016	0.0133	0.0816	0.1379
Intellectual/learning	0.0312	0.0023	0.1600	0.0459	0.0345
Musculo_skeletal	0.3021	0.3499	0.2533	0.2908	0.1264
Nervous system	0.0237	0.0203	0.0533	0.0255	0.0115
Psychological/psychiatric	0.1036	0.0339	0.2533	0.0179	0.1609
Respiratory system	0.0499	0.0429	0.0533	0.0459	0.0920
Others	0.0799	0.0587	0.1333	0.1173	0.0575
Unknown	0.2534	0.3589	0.0400	0.1224	0.1954
Financial variables					
Earned income>0	0.1199	0.0474	0.5467	0.1582	0.0345
Average earned income**	179.51	94.86	186.43	233.58	118.75
	(197.35)	(99.24)	(197.99)	(234.07)	(136.32)
Unearned income>0	0.4806	0.6005	0.3200	0.3163	0.3793
Average unearned income**	100.14	94.60	79.41	130.21	103.42
	(158.07)	(134.85)	(157.74)	(214.26)	(203.75)
Whether multi spells (spell>1)	0.1149	0.0316	0.4133	0.2296	0.023
Duration on DSP (years)***	6.20	7.60	2.70	4.20	6.50
	(6.1)	(6.1)	(3.7)	(5.8)	(6.2)

Note: * Standard deviations are in parentheses.

** Average earned and unearned income per fortnight for those who had them.

*** If a recipient has multi-spells, only the last spell was counted.

Males were a large proportion of recipients who exited for all destinations, but this proportion seemed to be larger among those who transferred to the Age Pension.

Entry age refers to the age when a recipient was granted DSP. However when multi-entries occurred, the age at last entry was used. As discussed earlier, when multi-entries (or spells) occurred, only the exit destination of the last spell was counted. Those who returned to work were the youngest at entry, with an average entry age of 35, and those who transferred to the Age Pension were the oldest, with an average entry age of 56. The entry age of those who exited due to death and other cancellations was in between.

To further explore the relationship between entry age and exit destinations, Table 7.2 presents the distribution of entry age by exit destinations.

Table 7.2: Distribution of entry age by exit destination

Age	All persons	Retirement	Return work	Other cancellation	Death
16-20	2.87	0.00	16.00	4.59	2.30
21-30	6.62	0.23	24.00	14.29	6.90
31-40	9.86	3.16	28.00	16.33	13.79
41-50	19.10	11.74	16.00	29.59	35.63
51-55	15.86	17.61	6.67	13.78	19.54
56+	45.69	67.27	9.33	21.43	21.84
	100.00	100.00	100.00	100.00	100.00

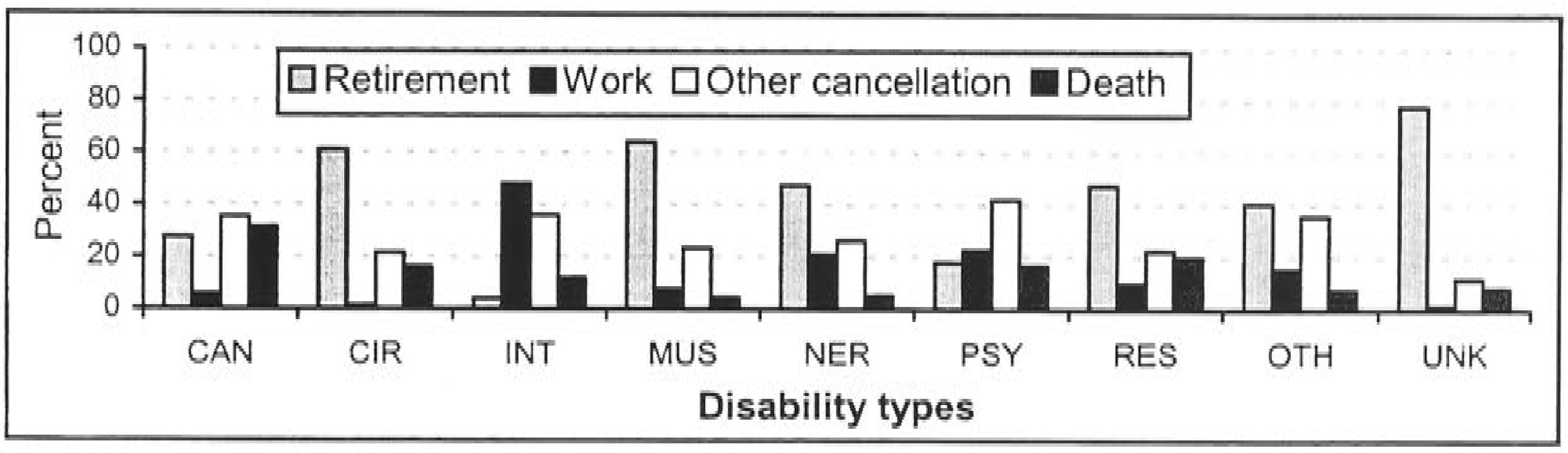
Of those who returned to work 40 percent had entered into DSP at an age younger than 31 and only 16 percent had entered after 50 years of age. In contrast, among those who transferred to the Age Pension, 85 percent entered after 50 years of age and almost very few entered at an age younger than 31. For both groups of recipients who exited due to other cancellation and death, a larger proportion entered after 40 years of age, while this proportion was even larger among those who exited due to death.

A very large proportion of those who returned to work were single in contrast to those who transferred to the Age Pension.

As for the disabilities of these recipients, Table 7.1 shows that there was a relatively larger proportion of psychological/psychiatric disability among those who returned to work. This is probably because this disability has a periodic nature. When the disability is not present, the recipients can go back to work. The proportion with intellectual/learning disability was also relatively large among those who returned to work.

To further explore the relationship between disability and exit destination, Figure 7.2 presents the distribution of exit destinations by disability types. The proportion returning to work was the highest for the intellectual/learning disability (55 percent), followed by psychological/psychiatric disability (28 percent) and nervous system disability (22 percent). Circulatory and unknown disabilities had the lowest proportion returning to work (both 1.6 percent).

Figure 7.2: Distribution of exit destinations by disability type



The variables discussed so far reflect the characteristics of the recipients when entering into DSP. Variables which may affect the behavior of recipients when receiving DSP benefit can also be constructed, including: financial variables, whether an individual experienced multi-spells of DSP recipiency and the duration on DSP. These variables are also presented in Table 7.1.

For a recipient the financial variables take the average value over the observable period of DSP recipiency. If multi-spells occurred the average over the last DSP spell was taken. Among those who left DSP, a few earned income, specifically 12 percent and the average income level was $179 per fortnight. This level of earned income suggests very low hours of work, probably less than 15 hours per week. The standard deviation for earned income is in the parenthesis. It is clear that there was considerable variation in earned income among those who had it.

For the proportion having earned income, there was considerable variation across the groups. Among those who returned to work, the proportion having earned income was very high (over one half). It was very low among those who transferred to the Age Pension and those who exited due to death. When looking only at those who had earned income, those who exited due to other cancellations had earned the most, and those who transferred to the Age Pension earned the least.

As might be expected, unearned income was more common than earned income. About 50 percent of these recipients received unearned income. On average the amount was $100 per fortnight. The proportion having unearned income among those who returned to work was similar to the proportion of those who exited due to other cancellations, but only about half of those who transferred to the Age Pension had unearned income. For those who had unearned income, the average unearned income was larger for the other cancellation recipients than for those who returned to work and transferred to the Age Pension. It is not possible from the data to distinguish unearned income sources for these recipients. Presumably, the higher proportion of those who transferred to the Age Pension having unearned income might arise because they were receiving a superannuation pension as a main source of unearned income. The highest amount of unearned income of those who exited due to other cancellations might be because they were receiving injury compensation.

A multi-spell variable was constructed, indicating whether a recipient had reentered into the DSP program before the last observed spell from which their final exit destinations were observed. Reentry is defined as having more than two fortnights break of benefit recipiency. The number of spells of those with an exit experience before the start of the data period (6 January 1995) cannot be identified. Therefore, this variable is not a perfect measure of multi-spells experience.

Of all the recipients in the sample, about 13 percent had more than one spell. Among those who returned to work this proportion was very high (41 percent) and among those who transferred to the Age Pension and who exited due to death it was very low (3 and 2 percent, respectively). Table 7.3 presents a detailed distribution of the number of spells by exit destination for the 801 recipients[5].

Table 7.3: Distribution of the number of spells by exit destination of those who exited DSP between 3 July 1998 and 25 February 2000

Number of spells	All persons	Retirement	Return work	Other cancellation	Death
1	88.51	96.84	58.67	77.04	97.70
2	7.74	2.48	22.67	16.84	1.15
3	2.25	0.68	12.00	3.06	0.00
4 to 7*	1.50	0.00	6.67	3.06	1.15
	100.00	100.00	100.00	100.00	100.00

* 7 is the highest number of spells.

The number of spells was related to entry age. Recipients with a young entry age tended to have multi-spells. Note that those who returned to work were also younger. For recipients who entered after 30 years of age, the older the entry age, the less likely they were to have multi-spells as implied in Table 7.4[6].

As for the duration on DSP before exit, those who returned to work had a much shorter completed duration, with approximately 60 percent experiencing a duration of less than two years and 20 percent less than half a year. Note that this duration refers

[5]When looking at all DSP recipients who ever appeared in the LDS data set between 6 January 1995 and 16 June 2000, the whole period covered by the one percent LDS data, the proportion having more than one spell is lower than that for the recipient sample used in this chapter. See Table 7.A3 in Appendix 7B. Note that the sample used here includes only those who exited DSP during the period 3 July 1998 to 25 February 2000.

[6] The proportion having multi-spells between males and females is similar and not reported here.

to the last recipiency spell. As shown earlier, those who returned to work also had the highest proportion having more than one spell. Those who transferred to the Age Pension had the longest duration. Table 7.A4 in Appendix 7B presents the duration distribution by exit destination of these recipients.

Table 7.4: Distribution of the number of spells by entry age of those who exited DSP between 3 July 1998 and 25 February 2000

Number of spells	Age groups 16-20	21-30	31-40	41-50	51-55	56 & over
1	65.22	60.38	77.22	90.85	93.70	93.72
2	26.09	26.42	12.66	6.54	3.15	4.92
3	8.70	11.32	1.27	1.31	1.57	1.37
4 to 7*	0.00	1.89	8.86	1.31	1.57	0.00
	100.00	100.00	100.00	100.00	100.00	100.00

* 7 is the highest number of spells.

From these descriptions, it is apparent that recipients who exited to different destinations might be groups of people with different characteristics. Those who returned to work were more likely to be younger, single, non-home owners, with a psychological/psychiatric or intellectual/learning disability, having earned income when receiving DSP and having multi-spells of benefit recipiency. In contrast, those who transferred to the Age Pension were more likely to be older when entering DSP, married, home owners, having no earned income but having unearned income and having only one spell of recipiency. Those who exited due to other cancellations lay in between.

However, there is a problem with this descriptive comparison. The effect of any observed difference in one aspect cannot be separated from the effect of the difference in others. For instance, a lower proportion of those who returned to work were married and had their own homes. But this relationship between low home ownership and returning to work might arise because this group was younger when they entered into DSP and it is age rather than home ownership that matters. To control for interrelationships among variables and to estimate the effect of different variables, an econometric model is needed. Furthermore, an econometric approach allows a test whether the difference in the effect of one variable is statistically significant among recipients who exited to different destinations. This is the task of the next section.

7.4. For those who leave, what determine their exit destinations?

This section employs the multinomial logit (MLG) model to examine what individual characteristics and other factors were associated with a specific exit destination among those who left DSP. The MLG model was discussed in Appendix 4C of Chapter 4.

Note, however, in the context of the recipient sample described in the previous section, by no means does this model estimation try to establish an unconditional causal relationship between explanatory variables and exit destinations. To establish an unconditional causal relationship would require a sample which contains a random entry cohort for whom all the exit destinations are known. But such data is not available as noted earlier. The sample used here includes only those who left DSP during a specific period of time. Therefore, it is probably better to regard this model estimation as a better way to summarize the data. In this sense the model estimation here is not a behavioral model. For these reasons, any interpretation of the estimation results should always be conditional on recipients who have left DSP.

Table 7.5 presents the estimation results by comparing those who returned to work, those who transferred to retirement and those who exited due to other cancellations. The included variables are those whose summary statistics are presented in Table 7.1 (except duration on DSP). The recipients who exited due to death were dropped in this estimation[7].

[7] This is because death is not an exit destination of research interest. However, the estimation results for comparing death with other destinations are presented in Appendix 7B.

Table 7.5: MLG estimation results on exit destinations

	$\ln(\frac{P_{Work}}{P_{Retirement}})$ (1)	$\ln(\frac{P_{Other-cancellations}}{P_{Retirement}})$ (2)	$\ln(\frac{P_{Work}}{P_{Other-cancellations}})$ (3)
Demographic variables			
Deviation of entry age from 16	**0.2257***	**0.2748****	**-0.0491**
Std.Err	*0.1203*	*0.1094*	*0.0588*
Deviation of entry age -squared	**-0.0090*****	**-0.0089*****	**-0.00002**
Std.Err	*0.0021*	*0.0018*	*0.0012*
Sex (male=1)	**1.4760*****	**1.1655*****	**0.3105**
Std.Err	*0.4665*	*0.3401*	*0.3615*
Marital status (single=1)	**0.6594**	**-0.2410**	**0.9004****
Std.Err	*0.4946*	*0.3078*	*0.4403*
Country of birth (foreign=1)	**0.3174**	**-0.5114***	**0.8288****
Std.Err	*0.4707*	*0.3009*	*0.4176*
No. of children	**0.1828**	**0.4325**	**-0.2497**
Std.Err	*0.6160*	*0.5561*	*0.2885*
Age of youngest child	**0.0577**	**0.0152**	**0.0425**
Std.Err	*0.0952*	*0.0812*	*0.0610*
Home ownership and rental arrangements			
Home owner(non-homeowner=1)	**0.1523**	**0.4110**	**-0.2587**
Std.Err	*0.6548*	*0.4514*	*0.5366*
Rent type (free rent=1)	**0.0776**	**0.1442**	**-0.0666**
Std.Err	*0.8774*	*0.6580*	*0.6634*
Rent type (Gov't rent=1)	**-0.7356**	**-0.8634**	**0.1277**
Std.Err	*1.0139*	*0.6529*	*0.8635*
Rent type (private rent=1)	**0.0802**	**0.3555**	**-0.2753**
Std.Err	*0.6568*	*0.5001*	*0.4776*
Financial variables			
Earned income>0	**1.5879****	**-0.4892**	**2.0771*****
Std.Err	*0.7621*	*0.6907*	*0.4667*
Amount of earned income	**0.0055**	**0.0065***	**-0.0010**
Std.Err	*0.0036*	*0.0035*	*0.0014*
Unearned income>0	**0.4606**	**-0.4264**	**0.8870****
Std.Err	*0.5161*	*0.3320*	*0.4475*
Amount of unearned income	**-0.0004**	**-0.0003**	**-0.0002**
Std.Err	*0.0019*	*0.0012*	*0.0016*

(Continue)

Table 7.5: MLG estimation results on exit destination (continued)

	$\ln(\frac{P_{work}}{P_{retirement}})$ (1)	$\ln(\frac{P_{Other-cancellations}}{P_{Retirement}})$ (2)	$\ln(\frac{P_{Work}}{P_{Other-cancellations}})$ (3)
Disability types			
Cancer/tumor (=1)	**7.0586*** **	**6.4993*** **	**0.5593**
Std.Err	*1.2524*	*0.8185*	*1.0305*
Circulatory(=1)	**3.2819** **	**4.4696*** **	**-1.1878**
Std.Err	*1.4631*	*0.6971*	*1.3280*
Intellectual and learning(=1)	**6.0622***	**5.2358**	**0.8264**
Std.Err	*3.2971*	*3.1880*	*0.9976*
Musculo_skeletal(=1)	**5.3119*** **	**4.5000*** **	**0.8119**
Std.Err	*0.9313*	*0.6098*	*0.7665*
Nervous system(=1)	**6.3585*** **	**5.2915*** **	**1.0670**
Std.Err	*1.3498*	*1.0367*	*1.0244*
Psychological/psychiatric(=1)	**6.0245*** **	**4.8560*** **	**1.1684**
Std.Err	*1.0244*	*0.7414*	*0.7785*
Respiratory system(=1)	**6.7466*** **	**5.1549*** **	**1.5917**
Std.Err	*1.1941*	*0.8029*	*1.0087*
Other disabilities (=1)	**5.7528*** **	**4.6998*** **	**1.0530**
Std.Err	*1.0426*	*0.7154*	*0.8370*
Whether multi -spells(spells>=2)	**3.2424*** **	**2.3961*** **	**0.8463** **
Std.Err	*0.6217*	*0.5531*	*0.3633*
Constant	**-4.8348** **	**-2.3843** **	**-2.1505**
Std.Err	*1.9821*	*1.7383*	*1.1358*
Summary statistics of model specification			
Number of observations	714		
LR test	645.14		
Degrees of freedom	48		
Log likelihood	-306.76		
Pseudo R-squared	0.5160		

Note: * Significant at 10 percent level;

** Significant at 5 percent level;

*** Significant at 1 percent level.

The estimates in the first column in Table 7.5 compare recipients who returned to work and those who transferred to retirement. The second column compares those who exited due to other cancellations and those who transferred to retirement. Coefficient estimates for those who returned to work relative to those who exited due to other cancellations can be inferred from the estimates in column (1) and (2)[8]. Their corresponding standard errors are, however, not readily determined. Thus the third column also reports the results for those who returned to work compared with those who exited due to other cancellations.

Due to the highly nonlinear nature of the MLG model, the interpretation of the coefficients is not straightforward, but the sign of the coefficient indicates the direction of change of the odds ratio, given a small change in the independent variable when all other variables are kept constant (see Appendix 4C in Chapter 4). A brief discussion of the significant variables follows.

The deviation of entry age from 16 enters the model estimation rather than the entry age itself because 16 is the minimum eligible age for DSP. The square of this variable is included to capture a higher order impact. The deviation of entry age from 16 is significant in equation (2) and weakly significant in equation (1). The square of the deviation of entry age is significant in both equations (1) and (2)[9], implying that the impact of the deviation of entry age variable is not linear on the log odds ratios. To illustrate the impact of this variable on the probability of exit to a particular destination (conditional on having exited), Figure 7.3 presents the predicted exit probability to each destination by entry age, keeping other variables constant at their mean values[10].

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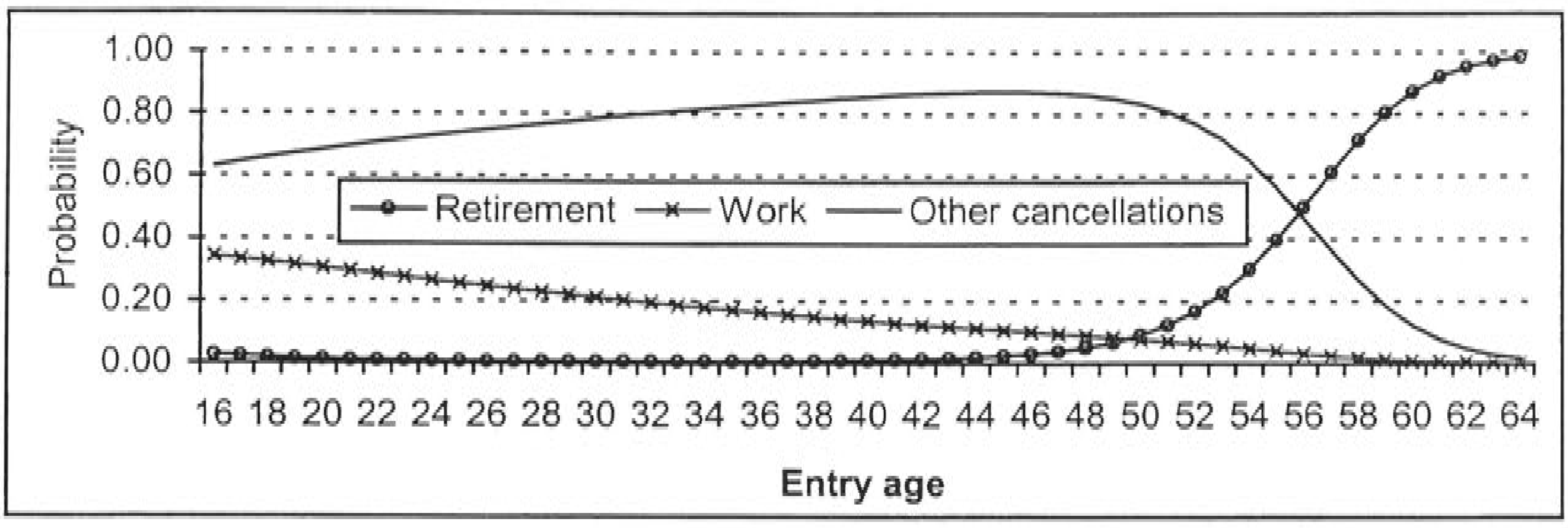
[8] From the equation (4.a6) in Appendix 4C, it can be easily shown that the coefficients on each independent variable in the third estimation is the difference between the corresponding coefficients of the second and the first estimation; That is

$$\ln\left(\frac{P_{Work}}{P_{Other-cancellation}}\right) = \ln\left(\frac{P_{Work}/P_{Retirement}}{P_{Other-cancellation}/P_{Retirement}}\right) = (\beta_{Work} - \beta_{Other-cancellation})' X_i .$$

[9] In equation (1), a joint test of the deviation of entry age from 16 and its square is strongly significant.
[10] Continuous variables are set at the means. For dummy variables the overall sample proportions of ones are used.

Figure 7.3: Predicted probability of exit to different destinations (conditional on having exited) by entry age



Among those who left, the probability of returning to work monotonically decreased with entry age. In other words, other things being equal, among those who exited DSP, the younger the recipients at entry the higher the probability of returning to work. Among those who exited DSP, for those who entered before 50 years of age, the probability of retirement was very low and it increased rapidly with entry age from then on. This is consistent with the simple tabulation results in Table 7.2.

The above results are not difficult to understand. If a recipient enters into DSP at a very young age, the individual has to wait for a long time to reach the Age Pension age. During that time, many life events may happen that lead the individual to leaving the benefit. In addition, for young recipients their expected life earnings loss is large if they stay on DSP. This may also provide an incentive for them to leave before reaching retirement age.

The gender variable is significant in equations (1) and (2), implying that, other things being equal, relative to the probability of transferring to the Age Pension, male recipients have a higher probability of returning to work or leaving due to other cancellations than female recipients. This may reflect the origin of the disability. Male disabilities may be more likely to be the results of accidents or work injuries. For these disabilities it may be easier to recover or to get compensation. The former leads to returning to work and the latter leads to other cancellations of the benefit.

The marital status variable is significant only in equation (3), implying that among those who had exited DSP, being single had a higher probability of returning to work relative to the probability of exit due to other cancellations. The country of birth variable is also only significant in equation (3), implying that among those who had exited DSP, relative to the probability of exit due to other cancellations, the probability of returning to work for non-Australian born recipients was higher than for Australian born recipients. These may be because single or non-Australian born recipients had a greater incentive to return to work because they had no other persons to turn to for support. In addition, for single people there is no chance that their benefits will be cancelled because of a spouse's very high income. It is also less likely that immigrants will have enough unearned income or assets to lead to the DSP benefit being cancelled.

The earned income indicator variable is significant in equations (1) and (3). The sign of this variable indicates that among those who had exited DSP, other things being equal, having earned income was associated with a higher probability of returning to work. This is consistent with the feature of the program. Having earned income is itself an indicator that the recipient has the ability to do some work and is then less likely to be eligible for DSP benefit (either due to recovery or means tested cancellation). But it is not clear through what mechanism this variable works. Having earned income may increase the likelihood of returning to work because work experience builds up skills of the recipients and their employability, which then encourage the recipients to leave for work. However, it is also possible that only those who have some capacity seek to work and then have earned income and leave the program. This is a self-selection result. If the latter is true, labour market programs aimed at helping DSP recipients work may have little impact because those with some earning capacities will exit to work anyway. But such program may speed up the process of leaving. Clearly, programs trying to move DSP recipients out to work will have a big role to play if the former is also true.

The unearned income indicator variable is significant in equation (3), implying that having unearned income also increased the probability of returning to work relative to exit due to other cancellations. This is not easy to explain because it is not possible to distinguish the sources of the unearned income.

For the disability variables, the omitted disability type is the unknown disabilities. Except for the intellectual/learning disability, all other disabilities are significant in equation (1) and (2), all with positive sign, implying that compared with the omitted unknown disabilities, these disabilities increased the probability of returning to work or exit due to other cancellations, relative to the probability of retirement. From equation (3), it appears that the disability types had no impact on the relative probabilities between returning to work and other cancellations.

The multi-spell variable is consistently significant in all three equations. The sign of the coefficient indicates that having multi-spells on DSP was associated with a higher probability of returning to work or leaving due to other cancellations, relative to the probability of transferring to the Age Pension. This result may be trivial because the Age Pension likes an absorptive state and those who transferred to the Age Pension would not transfer back to DSP. But for recipients who returned to work and who exited due to other cancellations, the possibility of coming back to DSP was high.

Having multi-spells was also associated with a higher probability of returning to work relative to other cancellations. In other words, compared with recipients who exited due to other cancellations, those who returned to work were more likely to have multi-spells. It is not clear whether this suggests that those who returned to work would for some reasons be more likely to have multi-spells or that those with multi-spells would be more likely to return to work. If the former is true, return to work is only a temporary phenomenon. If the latter is true, it may imply that for those who returned to work, they may have tried to work prior to the final exit and the trials may update their skills and facilitate their returning to work. From the policy point of view, the latter is the expected outcome.

Finally, for the MLG model, a test on whether any two outcomes (i.e., destinations here) can be collapsed into one outcome may be conducted (Freese and Scott, 2001). This is equivalent to test whether all the explanatory variables except for the constant term are jointly significant in a log odds ratio equation. Table 7.6 presents the results for a Wald test, which show that at the 1 percent significance level the hypothesis that a pair of destinations can be combined is rejected for any pair of destinations. The rejection of this hypothesis implies that two groups of recipients who exited to different destinations were statistically different in terms of the included observable variables.

Table 7.6: A Wald test for combining pairs of exit destinations

Pair of destinations tested	Chi2	P>Chi2
Retirement - other cancellations	125.627	0.000
Retirement - return to work	119.424	0.000
Other cancellations - return to work	54.96	0.000

7.4. Conclusion

In addition to the exit destinations commonly quoted by the administrative authority, using a data set containing the termination reason information, this chapter distinguished those who returned to work from other exit destinations. Combining this information with the other two FaCS data sets makes it possible to compare recipients who returned to work with those who transferred to the Age Pension and those who exited due to other cancellations. It would seems that recipients who returned to work possessed different characteristics compared with recipients who exited due to other reasons.

Compared with those who transferred to the Age Pension, those who returned to work were more likely to be young when entering into DSP. They were also more likely to be male, have earned income when receiving DSP benefit and be multi-spell recipients. Those who exited due to other cancellation were also more likely to be young, male and multi-spell recipients compared with those who transferred to the Age Pension. But, those who returned to work and those who exited due to other cancellation were different in terms of marital status, country of birth, whether or not they had earned income and whether or not they were multi-spell DSP recipients. Those who returned to work were more likely to be single, non-Australian born, have earned income and have had multi-spells of benefit recipiency, compared with those who exited due to other cancellations.

The results of this chapter are important in terms of policy implications and future research. DSP recipients consist of different groups of people who come from different sources (Chapter 4) with different characteristics and behave differently in terms of leaving the program and labour force attachment when receiving the DSP benefit. Future research therefore needs to study DSP recipients by different groups rather than as a whole and policy design also needs to differentiate targeted groups in order to be more effective.

Among other characteristics, entry age is an important factor associated with exit destinations of DSP recipients. We learn from this chapter that only those who enter into DSP at a relatively young age[11] are more likely to return to work and those who enter at an older age, such as over 55, are more likely to stay until retirement. For the older recipients, probably little can be done to enhance their outflows into the work force. On the other hand, labour market programs aimed at helping DSP recipients to return to work should target at newly entering young recipients.

Another important result is that those who return to work are more likely to have multi-spells. From a policy point of view, it is important to find out the exact relationship between returning to work and multi-spells, do multi-spells help recipients return to work or is it the case that those who return to work are more likely to come back and experience multi-spells? Here again different relationships imply different policy strategies.

[11] The young age here is relative and should not include those who enter at 16, the youngest eligible age for DSP. As noted earlier, for those who enter at 16, disabilities may come from birth and are serious. They are unlikely to recover and return to work.

Appendix 7A

Termination reasons codes and definitions in the FaCS data sets, and the selection of the sample

The one percent sample FaCS LDS data set does not include the termination reason field. Although transfers between different benefit programs can be identified, for example transfer from DSP to age pension or other benefit programs, recipients who exited income support payments due to other reasons, such as death, are not directly identifiable. Fortunately, FaCS has recently provided a termination reason data set, which provides detailed termination reasons for all recipients who exited from any income support payment program. The customer ID numbers (cust_id) in the two data sets can be matched so that exit destinations for those who exited any benefit program can be identified. Different benefit programs may share common termination reasons or there may be program specific reasons. Table 7.A1 lists the termination reason codes and definitions for DSP recipients.

The time period covered by the termination reason data set is shorter than the one percent sample data set. The former extends from 8 May 1998 to 25 February 2000, while the latter from 6 January 1995 to June 2000. This means that only the destinations of the recipients who exited DSP during the period covered by the termination data set can be identified. Therefore only those DSP recipients who terminated their DSP benefits during this period can be included in this study.

There is another data set that contains the disability type variable for DSP recipients. This can also be matched with the one percent sample. Since disability is an important variable in determining the behavior of DSP recipients, it would be very useful if this variable could be included in modeling the exit behaviors of the recipients. But, again, this data set covers a different time period. It extends from 3 July 1998 to 10 September 1999.

The difference in the covered period between the termination reason and the disability type data sets means that there are two groups of DSP recipients for whom their termination reasons can be identified but not their disability types: those who exited between 8 May 1998 and 3 July 1998 and those entered the program after 10 September 1999 and subsequently exited before 25 February 2000. While dropping the former does not cause any problem except that we are left with fewer observations, dropping the latter may lead to sample selection bias: the shorter duration recipients may be underrepresented in the sample. One solution may be to select only those who exited during the period covered by the disability type data set. But this would lead to about 280 recipients who entered the program before 10 September 1999 and exited between 10 September 1999 and 25 February 2000 (hence their termination reasons and disability types are available) being dropped out. In contrast, there are only 17 recipients who entered the program after 10 September 1999 and subsequently exited before 25 February 2000 and dropping these recipients from the sample may not cause a serious problem. The sample selection here follows this approach.

In addition, recipients who meet one of the following criteria are also dropped out for obvious reasons: (i) entry date is later than the exit date as coded in the termination reason data set; (ii) termination status in the termination reason data set is coded as rejection (for the rejection status, the benefits are assumed not to be granted at all); (iii) entry age is above age pension age (male 65 and female 61). After the above selection process there are 801 observations left. Table 7.A1 in this appendix presents the distribution of these 801 observations by termination reasons.

Those who exited due to death can be directly identified using the termination reason data, but those who transferred to the Age Pension cannot, since they are coded as IBT (internal benefit transfer) which includes those having transferred to the Age Pension and those who transferred to other income support payments. Therefore transfers to the Age Pension are identified by tracing whether the individual continues to stay in the one percent sample data set by receiving the Age Pension after having exited DSP. After identifying death and retirement, all those left are treated as cancellations and the summary statistics are provided in Table 7.A1.

Table 7.A1: Termination reason codes and definitions

	Code	Definition	No.of persons
1	ASS	Asset over limit	6
2	CLR	Clients request	12
3	CMP	Precluded due to compo dir/DD	8
4	COM	Compo preclusion	11
5	DEA	Death	87
6	DOS	Departure overseas	1
7	DVA	Service pension/inc support supplement	7
8	EAN	Earnings	37
9	ENQ	Pending enquiries	4
10	FRC	Fail to return correspondence	5
11	FTM	Fail to return DSP medical review	7
12	FTW	Return to work--notify by 14 days	27
13	IBT	Internal benefit transfer	446
14	IMP	Customer in prison	11
15	INC	Income precludes entitlement	19
16	INV	Investigation	3
17	ITO	Interstate transfer out	2
18	NAR	Not resident in Australia	1
19	NMQ	not medically qualified	0
20	NSI	Less than 20 percent impaired	5
21	NTC	Not provide TFN	1
22	O4W	Overseas in NZ 4 weeks	3
23	OTH	Other reasons	15
24	PER	FTR entitlement review	3
25	RDC	Return direct credit payment	2
26	RSK	Greater than 20 percent impaired/can be reskilled	1
27	RTA	Return to Australia	1
28	RTW	Return to work	3
29	WFT	Greater than 20 percent /can work full time	1
30	WUK	Whereabout unknown	10
31		Blank (not coded)	62
	Total		801

Appendix 7B

Table 7.A2: MLG estimation results, compared with death exit

	$\ln(\frac{P_{retiremtent}}{P_{death}})$ (1)	$\ln(\frac{P_{other-cancellation}}{P_{death}})$ (2)	$\ln(\frac{P_{return-work}}{P_{death}})$ (3)
Demographic variables			
Age at grant /5	-0.3772***	-0.1128*	-0.1654**
Std.Err	0.0986	0.0633	0.0769
Age at grant /5--squared	0.0100***	0.0017	0.0018
Std.Err	0.0017	0.0012	0.0015
Sex (male=1)	-1.3047***	-0.2376	0.0674
Std.Err	0.3687	0.3194	0.4386
Marital status (single=1)	-0.2422	-0.3862	0.5159
Std.Err	0.3527	0.3521	0.5229
Country of birth (foreign=1)	0.2293	-0.3415	0.5593
Std.Err	0.3389	0.3508	0.4905
No. of children	-0.1905	0.2324	-0.0208
Std.Err	0.5478	0.3484	0.4339
Age of youngest child	-0.0075	-0.0303	0.0106
Std.Err	0.0814	0.0625	0.0814
Home ownership and rental arrangements			
Home owner(non-homeowner=1)	-1.2451***	-0.9634**	-1.2428**
Std.Err	0.4742	0.4516	0.6345
Rent type (free rent=1)	-0.2975	0.1560	0.1145
Std.Err	0.6367	0.5847	0.7910
Rent type (Gov't rent=1)	0.7996	-0.0465	0.2778
Std.Err	0.6078	0.5799	0.9184
Rent type (private rent=1)	0.2675	0.6319	0.3544
Std.Err	0.4899	0.4254	0.5754
Financial variables			
Earned income>0	1.4461	1.1225	3.1936***
Std.Err	0.9855	0.8656	0.9031
Amount of earned income	-0.0035	0.0020	0.0010
Std.Err	0.0053	0.0045	0.0045
Unearned income>0	0.1274	-0.4244	0.4671
Std.Err	0.3621	0.3510	0.5040
Amount of unearned income	0.0003	0.0005	0.0004
Std.Err	0.0013	0.0011	0.0017

(Continue)

Table 7.A2: MLG estimation results, compared with death exit (continued)

	$\ln(\frac{P_{retiremen\ t}}{P_{death}})$ (1)	$\ln(\frac{P_{other-cancellati\ on}}{P_{death}})$ (2)	$\ln(\frac{P_{return-work}}{P_{death}})$ (3)
Disability types			
Cancer/tumor (=1)	-6.1477***	-0.5307	-0.0301
Std.Err	0.7420	0.5331	1.0471
Circulatory(=1)	-4.3444***	-0.3848	-1.5521
Std.Err	0.6391	0.5706	1.3804
Intellectual and learning(=1)	-5.4226**	-0.8193	0.0662
Std.Err	2.3380	0.9494	1.2408
Musculo_skeletal(=1)	-3.0641***	0.7745	1.5922*
Std.Err	0.5855	0.5017	0.8501
Nervous system(=1)	-4.0890***	0.6728	1.8200
Std.Err	1.2716	1.2106	1.4570
Psychological/psychiatric(=1)	-3.6847***	0.4970	1.5528
Std.Err	0.7354	0.6410	0.9693
Respiratory system(=1)	-3.9503***	0.0704	1.1926
Std.Err	0.6867	0.4974	0.8469
Other disabilities (=1)	-4.91480***	-0.6602	0.7522
Std.Err	0.7297	0.6571	1.0623
Whether multi spells (spells>=2)	-0.2424	2.0260***	2.9134***
Std.Err	0.8796	0.7618	0.8049
Constant	5.4826***	3.1302***	0.6785
Std.Err	1.6002	1.0807	1.4160
Summary statistics of model specification			
Number of observation	801		
LR test	773.72		
Degree of freedom	72		
Log likelihood	-522.21		
Pseudo R-squared	0.4256		

Note: * Significant at 10 percent level;
** Significant at 5 percent level;
*** Sigficant at 1 percent level.

Table 7.A3: Distribution of the number of spells, all DSP recipients between 6 January 1995 and 16 June 2000

Number of spells	All recipients	Age groups 16-20	21-30	31-40	41-50	51-55	56 & over
1	93.58	92.73	87.57	91.74	93.43	94.41	96.06
2	5.18	5.48	9.08	6.31	5.51	4.85	3.38
3	0.84	1.40	1.82	1.11	0.79	0.46	0.47
4 to 7*	0.41	0.38	1.54	0.83	0.26	0.27	0.09
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of recipients	8379	784	716	1078	1888	1092	2336

Table 7.A4: Duration distribution by exit destination of those who exited DSP

Duration	All persons	Retirement	Return work	Other cancellation	Death
<0.5 year	6.99	1.58	20.00	14.80	5.75
0.5<=&< 1 year	8.74	3.61	21.33	15.82	8.05
1<= & <2 years	11.86	8.35	20.00	18.88	6.90
2<= & <3 years	9.24	8.35	12.00	10.71	8.05
3<= & <4 years	10.36	10.84	9.33	7.14	16.09
4<= & <5 years	9.11	9.71	4.00	9.69	9.20
>=5 years	43.70	57.56	13.33	22.96	45.98
	100.00	100.00	100.00	100.00	100.00

Chapter 8

Conclusion And Remark

The number of DSP recipients has grown very rapidly over the last three decades, much faster than the DSP age eligible population. In 1971 fewer than 2 in 100 males aged 16 to 64 received DSP benefits, but in 1999, 6 in 100 of this population received DSP benefits.

The number of DSP recipients is determined by inflows and outflows. This thesis explains the growth of the DSP program in an inflow-outflow framework and explores the determinants of DSP inflows and outflows. This concluding chapter summarizes the main findings and provides concluding remarks.

8.1. What do we learn from this thesis?

8.1.1. Inflows, outflows and DSP program growth

Either an increase in inflows (or the inflow rate) or a decrease in outflows (or the outflow rate) can increase the number of DSP recipients. A decrease in the outflow rate is equivalent to an increase in the completed duration on DSP benefit. In this inflow - outflow framework, what do we learn about the reasons for the growth of the DSP program over the last three decades?

Chapter 2 showed that over the last three decades both the increase in the inflow rate and the decrease in the outflow rate have contributed to the DSP program growth. But the increase in the inflow rate appeared to have contributed more than the decrease in the outflow rate. Over the period 1971 to 1999, 36 percent of the increase in the number of DSP recipients could be attributed to inflow rate changes, 33 percent could be attributed to outflow rate changes and 16 percent could be attributed to population growth.

Following the introduction of the Disability Reform Package (DRP) in 1991, the inflow rate increased sharply and stayed at a higher level during the 1990s. Over the period 1991 to 1999, 47 percent of the increase in the number of DSP recipients could be attributed to the inflow rate change over this period. In contrast, only 10 percent could be attributed to the outflow rate change and 7 percent to population growth.

Therefore, over the last three decades, increases in the inflow rate were more important than decreases in the outflow rate in contributing to the program growth. In addition, changes in the number of DSP recipients were closely associated with variations in DSP recipient inflows. Hence, to understand the growth of the DSP program, we need to explain the changes in inflows and the inflow rate. This is the task of Chapter 3. In addition, the impact of inflows on the number of DSP recipients is long lasting and is determined by the distribution of completed duration of inflows. Therefore, it is probably better to work on inflows rather than on the number of DSP recipients (this is like a stock) to understand the growth of the program.

Inflows are determined by the number of applications from potential recipients and grants of the applications by the administrative authority. Using aggregate data including national aggregate time series and cross-states-time-series data, Chapter 3 looked at the determinants of the application rate, defined as the number of applications per 1000 DSP age eligible population, and the grant rate, defined as the number of grants per 1000 DSP age eligible population. It was found that labour market conditions represented by the unemployment rate and policy changes had significant impacts on DSP application and grant rates. Other factors, such as the relative value of DSP benefit and changes in population structure (or population ageing) did not appear to have any significant impact on the application and grant rates and therefore no significant impact on the past rate of program growth. As for policy changes, the results showed that while the policy change in 1980 reduced the application and grant rates as expected, the policy change in 1991 increased these rates, a result which was probably not expected at the time the policy was implemented.

Simulated results from Chapter 3 showed that changes in the unemployment rate over the period 1970 to 1999 was able to explain 40 percent of the increase in the number of DSP recipients over this period and the policy change in 1991 was able to explain 31 percent of the increase in the number of recipients from 1990 to 1999. The policy change in 1980, which only tightened the eligibility rules without changing the legislative eligibility criteria, was very important in reducing the inflow rate and inflows, which then substantially contributed to containing the growth of the program.

As for labour market conditions, it was also found from Chapter 3 that it was the one-year lagged unemployment rate that had the significant impact on the application and grant rates. This may suggest that many individuals who applied for DSP when becoming unemployed during a recession might only do so after some search for other sources of support (such as looking for a job).

One would expect grants to respond to policy changes. But, in addition, the results from Chapter 3 indicated that DSP applications not only respond to the change in legislative eligibility criteria, the aggregate time series data suggested that applications also respond to the change in the way in which the eligibility rules are implemented even without changes in legislation. Either individuals form their own probability of success when making an application decision, or applications are mainly lodged following the advice from government agencies who know the eligibility rules much better than the individual applicants.

8.1.2. Sources of DSP inflows

To understand fully the determinants of inflows, we would like to know how individuals decide on whether to participate in the DSP program, but there is no available data which goes directly to the reasons for individual decisions. However, the FaCS one percent sample LDS data allows us to examine one main source of DSP inflows – transitions from unemployment benefit to DSP.

Using the LDS data, it was found (Chapter 4) that over the period between 1995-96 and 1999-2000, over 60 percent of DSP recipients came from other income support payments, of which most were former unemployment benefit recipients. Among those who transferred from unemployment to DSP, not only did a large proportion (50 to 70 percent) experience multi-spells of income support payment recipiency prior to the transition, but also 55 to 66 percent had more than half a year pre-transition unemployment duration, with the average pre-transition unemployment duration being more than one year.

When a multinomial logit model was applied to the 1995-96 unemployment cohort to identify the factors that determine the probability of transition from unemployment to DSP, it was found that among other factors, unemployment duration had a significant impact. The longer the duration on unemployment benefit the more likely was the transferred to DSP. For an unemployed person, with the mean characteristics of the group who transferred to DSP from unemployment and an unemployment duration of two months, the probability of transferring to DSP was 4 percent; if the person had been unemployed for one year, the probability increased to 7 percent; if on unemployment benefit for three years, the probability increased to 18 percent.

Another important factor in determining the transition probability is individual age when becoming unemployed. The older the age of an unemployed person the more likely was the transition to DSP. For a typical unemployed person, if becoming unemployed at age of 55, the probability of transferring to DSP was 25 percent. If the unemployed person was 30 when becoming unemployed, the probability of transferring was only 3 percent.

Marital status, whether having earned income, the amount of earned income when receiving unemployment benefit and the activity test types required when receiving unemployment benefit are also important in determining the transition probability. Single unemployed persons were more likely to transfer to DSP compared with married persons; having earned income and an increase in the amount of the earned income reduced the probability of the transition.

The importance of the unemployment duration on the transition from unemployment to DSP, and the fact that a large proportion of DSP inflows came from unemployed persons, suggests a direct link between unemployment and DSP participation. This reinforces the finding in Chapter 3, where the significant positive impact of the unemployment rate on the application and grant rates of DSP benefits was established. This relationship will be further discussed later.

8.1.3. Duration and exit destinations of DSP recipients

Since the number of DSP recipients is also determined by the duration of recipients, it is important to understand how duration is determined, or equivalently the factors that determine the hazard rate of DSP recipients. Chapter 5 addressed this issue by applying the duration model to a selected sample from the FaCS one percent sample LDS data. The estimation results showed that the age at entry into DSP, gender, country of birth, amount of earned income, whether having unearned income and recipient source were all statistically significant determinants of the hazard rate or duration.

The entry age had an inverse U-shape impact on the hazard rate. Recipients who entered into DSP between 21 and 40 years of age had the highest hazard rate and among them the hazard rate was not statistically significantly different. DSP recipients with an entry age younger than 21 had the lowest hazard rate. For recipients entering after 50 years of age, the older the entry age the lower the hazard rate. This inverse U-shape impact of entry age may reflect individual health conditions and the labour market prospects of DSP recipients. Other things being equal, males had a higher hazard rate than their female counterparts and Australian born recipients had a higher hazard rate than immigrants. The amount of earned income when receiving DSP increased the recipient's hazard rate, but having unearned income reduced the hazard rate. Interestingly, recipients who transferred from unemployment had the lowest hazard rate, while those who came from outside the income support system had the highest hazard rate, and the hazard rate of those who transferred from other income support payments fell somewhere between.

These results indicate that recipients with different characteristics have different potentials for leaving the DSP program. Those who leave DSP the fastest are characterized as middle age (especially, 31-40), male, Australian born, coming from outside the income support system, having no unearned income and with very high earned income when receiving DSP benefit. Those who leave the slowest are characterized as very young (younger than 21 years old) or close to the Age Pension age on entering into DSP, female, non-Australian born, having transferred from unemployment, having unearned income and no earned income when receiving DSP benefits. One important policy implication of these findings is that any policy or program aimed at facilitating outflows of DSP recipients will need to acknowledge and respond to these recipient differences and also focus on those who are more likely to leave.

However, although those recipients who transfer from unemployment appear to leave the slowest, their disability may not be as severe (or obvious) as those who go directly to DSP from outside the income support system. That is they may have the potential to leave faster. Because these recipients consist of a large proportion of inflows, the behavior of this recipient group warrants further study.

The unemployment rate variable was included in the duration model estimation and its impact on the hazard rate was not confirmed by the model estimation results. This is in contrast to the finding in Chapter 3 that DSP application and grant rates were significantly affected by the unemployment rate. These results imply that when individuals make a decision on whether to participate in the DSP program, they take into account labour market conditions and their prospects of employment. But, once on the program, labour market conditions are not important in affecting their decision on whether to leave the program. Therefore, while an economic recession pushes the disabled people into the DSP program, a boom will not draw them out.

Based on the parameters estimated in Chapter 5, Chapter 6 estimated the expected completed duration of DSP recipients. This estimation is important because the projection of future program costs depends on the estimation of completed duration, and the time horizon of the impact of a change in inflows on the number of DSP recipients depends on the completed duration.

From Chapter 6, the average expected completed duration before retirement was about 9 years for a cohort, but it varied with gender, entry age and recipient source. Female recipients had a longer expected completed duration (9.5 years if the female retirement age was 60 and 12 years if the female retirement age was 65). Their male counterparts had a shorter duration (8.8 years). Recipients who transferred from unemployment had the longest expected completed duration (10.8-11.8 years depending on the assumption about the female retirement age), while recipients who came from outside the income support system had the shortest expected completed duration (7.6-8.3 years). Recipients who transferred from other income support payments had an average expected completed duration of 8.2-9.7 years. The younger the entry age of the DSP recipients the longer the expected completed duration. In terms of the proportion of time spent on DSP before reaching retirement, for new recipients who entered after 20 years of age, the older the entry age, the larger this time proportion. But for those who entered at an age younger than 20, this time proportion was larger than those who entered between 21 and 30 years of age.

Chapter 5 identified the factors that determine the speed of leaving DSP and did not consider the destinations of exit. To understand the full dynamics of DSP recipients, we would like to know how the exit destination is determined. However, data are not available for identifying the determinants of exit destinations of typical DSP recipients, although this is an important issue. From currently available data, it is only possible to identify the exit destinations of the recipients who exited during a specific time period. But by combining the one percent sample LDS data with other two FaCS data sets available, it is possible to distinguish those who returned to work from other exit destinations and examine whether recipients who exited to different destinations had different characteristics.

The findings in Chapter 7 showed that, among those who exited DSP during a specific time period, the proportion returning to work was very small (less than 10 percent) and the majority transferred to the Age Pension (55 percent). Indeed, recipients who exited to different destinations appeared to be different groups of people, especially comparing those who returned to work with those who transferred to the Age Pension. Compared with those who transferred to the Age Pension, those who returned to work were more likely to be young when entering into DSP. They were also more likely to be male, have earned income when receiving DSP benefits and be multi-spell recipients. Those who exited due to other cancellations were also more likely to be young, male and multi-spell recipients compared with those who transferred to the Age Pension. But, those who returned to work and those who exited due to other cancellations were different in terms of marital status, country of birth, whether or not they had earned income and whether or not they were multi-spell DSP recipients. Those who returned to work were more likely to be single, non-Australian born, have earned income and have multi-spells of benefit recipiency, compared with those who exited due to other cancellations.

One important point to emerge from the above findings is that DSP recipients are quite clearly different groups of people. They came from different sources (Chapter 4). Recipients with different characteristics behaved differently in terms of leaving speed (Chapter 5) and exit destinations (Chapter 7). As noted in Chapter 7, this has important implications in terms of policy development and future research. To put it simply, future research should probably study DSP recipients by different groups (say by recipient source or entry age) rather than as a whole. Similarly, policy development should also be differentiated to target different recipient groups so that policy will be more effective.

8.2. Concluding remark

From the findings of this thesis, several points stand out and may be worth re-emphasizing:

(a) This thesis showed that DSP participation and unemployment have a close relationship. It is well established in the literature, and from the results in Chapter 3, that worsening labour market conditions raise disability benefit participations through increased recipient inflows. In addition, Chapter 4 showed a direct link between unemployment and DSP inflows: a great proportion of DSP inflows were from the unemployed persons and unemployment duration had a positive impact on the transitions from unemployment to DSP. The fact that those DSP recipients who transferred from unemployment did not directly apply for DSP benefit before their prolonged experience of unemployment, might imply either that they knew they were not eligible for the benefit, or that if they were eligible, they did not want to apply at the time of becoming unemployed. As discussed in Chapter 4, if the former is true, this suggests that unemployment leads to deterioration of individual health conditions or unemployment makes a person more acceptable to the administrative authority to be granted the DSP benefit. If the latter is true then it might mean that these persons do want or hope to go back to work at the time of becoming unemployed. They applied for DSP later perhaps because they could not find jobs. This appears to be consistent with the finding in Chapter 3 that only the lagged unemployment rate had a significant impact on DSP applications. If this is true then it further suggests that perhaps it is not the disability that makes a person apply for DSP benefit, rather it is the failure of getting a job when being unemployed that works as a driving force, at least for most of those who transferred from unemployment to DSP. Whatever the case, this could suggest that more employment opportunities might be the most important measure to prevent people from turning to DSP.

(b) Disability benefit participation is the result of interactions of many factors involving health conditions, labour market prospects, and the relative value of DSP benefit. Although the impact of the relative value of DSP benefit on the inflow rate was not confirmed in Chapter 3, probably because the determination of the DSP benefit in Australia is quite different from other nations and there was little variation in its value, its impact is established in the literature. Individual labour market prospects not only depend on labour market conditions, they are also determined by individual characteristics, such as age and gender. Given health conditions and labour market conditions, older people are more likely to apply for the benefit because their labor market prospects are not quite as good, and probably also because of this, they are more likely to be granted DSP benefit by the administrative authority.

(c) From (a) and (b), it seems, for the marginal disability benefit applicants, that it is probably not a preference for leisure to work that makes them apply for DSP benefit, rather it may be because there are simply no employment opportunities for them. If they need an income to live on, they must turn to DSP.

(d) There are asymmetric impacts of labour market conditions on DSP inflows and outflows. While the impact of labour market conditions on inflows is confirmed in this thesis, and well established in the literature, its impact on outflows is not confirmed as shown in Chapter 5. In addition, the aggregate data did not show any association between the outflow rate and the unemployment rate. Once in, DSP recipients tend to stay. As discussed earlier, the reason may be that: (i) it is not easy to establish eligibility for DSP (especially for the marginal persons); (ii) DSP recipiency experience may have a stigma impact on employment; and (iii) human capital depreciates when receiving DSP. Only those who fully recover and/or who are sure to get a job when leaving (no matter what the labour market conditions are) choose to leave.

(e) It is understandable why disability benefit policies are normally targeted at inflows, such as implementing new eligibility requirements for new applicants, rather than at outflows. The incentive of a potential applicant to work may be higher than that of a long staying current DSP recipient. If an application for DSP has a stigma impact on the labour market outcome, the stigma impact of having been receiving the benefit must be greater. Therefore, the labour market prospects for current DSP recipients must be worse than for the potential applicants. Therefore, while tightening rules for potential applicants may encourage them to work, directly cutting off recipients from benefits may only move them from one benefit payment to another.

However, the hazard rate is clearly affected by individual characteristics (Chapter 5). In addition, Chapter 7 showed that only recipients with certain characteristics were more likely to return to work from the DSP program. Thus labour market programs targeted at selected recipients may be more effective in facilitating the transition from DSP recipiency to work.

(f) Long duration of DSP recipients means that any change in policy which impacts on inflows would have a prolonged impact on the number of DSP recipients. Together with the finding that applications respond to policy changes (Chapter 3) (even without change in the legislative eligibility requirement as in 1980), this suggests that any policy change which could effectively relax the eligibility requirements must be considered and assessed carefully before implementation, and the policy changes in 1991 may be a good lesson in this regard. These policy changes seem still to be influencing the growth of the DSP program a decade later.

8.3. Questions need further research

Due to data limitations and the scope of this thesis, some interesting questions are not addressed, but they are important from both academic and policy points of view. The obvious questions which need further research include,

(a) *Why has the outflow rate been decreasing over the last three decades?* We learned from Chapter 2 that the increase in the inflow rate and the decrease in the outflow rate had contributed to the growth of the DSP program. In this thesis the focus was on explaining the change in the inflow rate because it was more important. The reasons for the decrease in the outflow rate were not explained because to do this would require detailed information on the characteristics of the inflows of the last three decades and such data does not seem to be available at this time. If this kind of data became available in the future, the reasons for the past decrease in the outflow rate should be examined.

(b) Not all persons with disability participate in the DSP program, some choose to work. Then, *given health conditions, what determines the individual DSP participation decision?* Although Chapter 3 provides a model for DSP participation, it did not actually answer this question empirically, again, because of unavailability of data.

(c) *What is the total completed length of stay on DSP?* Chapter 6 estimated the expected completed duration of the first spells for DSP recipients. But, 'churning' occurs among DSP recipients. Some recipients having left DSP come back later and the completed duration of the first spells does not reflect their true length of total stay on DSP. However, to estimate the total completed length of stay we need a data set spanning a much longer period than currently available. Hopefully these data will become available with further development of the FaCS LDS data in the future.

(d) *How does the DSP program interact with other income support payment programs?* Chapter 4 examined the transition of recipients from unemployment to DSP and Chapter 5 found that DSP recipients who transferred from unemployment had a lower hazard rate than those from outside the income support system. But there are other important questions in this regard, such as, how does policy change in other income support payments affect individual behavior in terms of entering into and leaving DSP benefit? For DSP recipients who transfer from other income support payments (such as unemployment), what are their total times on the income support system (not just on DSP)? Do those DSP recipients who transfer from other income support payments have a longer total time on the income support system than those who come from outside the income support system? When the FaCS LDS data become available for a longer period of time these questions can be addressed.

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